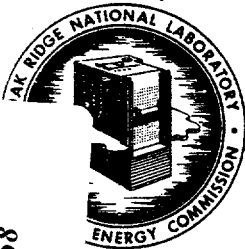


ORNL-CF-64-11-62

OPERATING PROCEDURES  
FOR  
RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL

THIRD REVISION - JUNE 1971



This document has been approved for release  
to the public by:

*David R. Hamlin* 8/23/95  
Technical Information Officer Date  
ORNL Site

OAK RIDGE NATIONAL LABORATORY  
Oak Ridge, Tennessee  
operated by  
UNION CARBIDE CORPORATION  
for the  
U. S. ATOMIC ENERGY COMMISSION

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ORNL-CF-64-11-62

OPERATING PROCEDURES  
FOR  
RADIOACTIVE LIQUID AND GASEOUS WASTE DISPOSAL

Third Revision - June, 1971

## CONTENTS

	<u>Page</u>
Procedure Policy . . . . .	
1. Intermediate Level Waste System, Bethel Valley . . . . .	1-1
1.1. Intertank Transfer Procedures . . . . .	1-1
1.1.1. To Jet W-1 to W-5 . . . . .	1-5
1.2. ILW Neutralization . . . . .	1-8
1.2.1. To Check the pH of ILW in a Collection Tank . . .	1-8
1.2.2. To Neutralize W-5 or W-6 from the Caustic Tank . .	1-9
1.2.3. Operation of Caustic Truck . . . . .	1-10
1.3. Transfer to Shale Fracturing . . . . .	1-13
1.3.1. Pumping Procedures . . . . .	1-13
2. Process Waste System, Bethel Valley. . . . .	2-1
2.1. Tributary Control System . . . . .	2-1
2.2. Diversion Box. . . . .	2-8
2.3. Other Monitoring Stations . . . . .	2-10
2.4. Equipment Maintenance . . . . .	2-12
2.5. Waste Treatment Plant . . . . .	2-13
2.5.1. Shift Checks - All Shifts . . . . .	2-13
2.5.2. Special 8-4 Shift Checks . . . . .	2-15
2.5.3. Procedures for Valving Process Waste through the Waste Treatment Plant . . . . .	2-15
2.5.4. Procedures for Water Analysis . . . . .	2-18
2.5.5. Chemical Feed Calculations . . . . .	2-21
2.5.6. Procedures for Operating Chemical Feed Machines .	2-23
2.5.7. Waste Treatment Plant Effluent . . . . .	2-24

2.6.	Procedures for Sludge Removal . . . . .	2-25
2.6.1.	Pumping of Sludge from Pit to Trailer . . . . .	2-25
2.6.2.	Sludge Trailer Transit . . . . .	2-27
2.7.	Emergency "Hold-Up" Pond . . . . .	2-28
2.8.	4500 Area Process Waste Ponds . . . . .	2-29
2.9.	Monthly Composite Samples - Process Waste . . . . .	2-30
2.9.1.	Flume Station, Settling Basin, White Oak Creek, and Melton Branch . . . . .	2-30
2.9.2.	Manholes and Influent Process Waste Treatment Plant . . . . .	2-34
3.	Gaseous Waste System . . . . .	3-1
3.1.	Radiation Monitoring and Sampling . . . . .	3-2
3.1.1.	General . . . . .	3-2
3.1.2.	Unusual Occurrences . . . . .	3-5
3.2.	Cell Ventilation System . . . . .	3-10
3.2.1.	Procedures in the Event of a Power Failure . . . . .	3-10
3.2.2.	Procedures after Resumption of Normal Power . . . . .	3-12
3.2.3.	Test Procedures for the Emergency Blowers . . . . .	3-13
3.3.	Off-Gas System . . . . .	3-16
3.3.1.	Off-Gas Control System . . . . .	3-16
3.3.2.	Caustic Scrubber . . . . .	3-16
3.3.3.	Test Procedure for the Emergency Off-Gas Equipment. . . . .	3-21
3.3.4.	Standby Operation of the Auxiliary Off-Gas System . . . . .	3-22
3.3.5.	Startup of the Auxiliary System . . . . .	3-29
3.3.6.	Procedures in the Event of a Power Failure . . . . .	3-30
3.3.7.	Test Procedure for the Auxiliary Off-Gas System . . . . .	3-31
3.3.8.	ORR Pressurizable Off-Gas System . . . . .	3-31

3.3.9. Test Procedure for 8-in. Vacuum Relief Valve at 3039 Off-Gas System . . . . .	3-33
4. Intermediate Level Waste System, Melton Valley . . . . .	*
4.1. Description of Facilities . . . . .	
4.1.1. General Description . . . . .	
4.1.2. HFIR Collection Station . . . . .	
4.1.3. Melton Valley Central Collection & Pumping Station	
4.2. Procedure for Operation of HFIR Station . . . . .	
4.2.1. Waste Recirculation . . . . .	
4.2.2. Sampling . . . . .	
4.2.3. Neutralization by Addition of Caustic . . . . .	
4.2.4. Transfer to the Melton Valley Central Collection and Pumping Station . . . . .	
4.2.5. Return of Transfer System to Standby . . . . .	
4.2.6. Flushing of Pumps & Piping Prior to Entering Pump Pit . . . . .	
4.3. Transfer of Waste from Other Melton Valley Facilities . .	
4.4. Operation of the Melton Valley Central Collection and Pumping Station . . . . .	
4.4.1. Receiving Waste from Facilities . . . . .	
4.4.2. Recirculation . . . . .	
4.4.3. Sampling . . . . .	
4.4.4. Transfer to South Tank Farm . . . . .	
4.4.5. Sump . . . . .	
4.4.6. Use of Tank T-3 for Decontamination of Equipment or Solution Addition . . . . .	
4.4.7. Filling of Tank T-3 . . . . .	
4.4.8. Flushing of Pumps and Piping with Water or Solution from T-3 . . . . .	

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\*Section 4 to be revised at a later date.

5.	Process Waste System, Melton Valley . . . . .	5-1
5.1.	Description of Facilities . . . . .	5-1
5.1.1.	General Description . . . . .	5-1
5.1.2.	Collection Ponds . . . . .	5-1
5.1.3.	Pumping Station . . . . .	5-3
5.1.4.	Transfer Line . . . . .	5-5
5.1.5.	Monitoring Stations . . . . .	5-5
5.2.	Operating Procedures . . . . .	5-6
5.2.1.	Sampling Procedure Prior to Transfer . . . . .	5-6
5.2.2.	Procedure for Transfer of Waste . . . . .	5-7
5.2.3.	Emptying the Pumping Station Sump . . . . .	5-7
6.	Operating Records . . . . .	6-1
6.1.	Daily Records . . . . .	6-1
6.1.1.	Shift Check Sheets . . . . .	6-1
6.1.2.	Shift Log Books . . . . .	6-1
6.2.	Other Records . . . . .	6-7
7.	Evacuation Procedures . . . . .	7-1
7.1.	Tank Farm, Process Waste Treatment Plant and Waste Evaporator . . . . .	7-1
7.2.	3039 Stack Area . . . . .	7-1
7.3.	Equipment Decontamination Building . . . . .	7-1
7.4.	Practice Evacuation . . . . .	7-1
8.	Equipment Decontamination . . . . .	8-1
8.1.	Requirements for Decontamination . . . . .	8-1
8.2.	Decontamination Procedures . . . . .	8-1
8.2.1.	Solutions . . . . .	8-1
8.2.2.	Procedures . . . . .	8-2

9. Patrol Activities . . . . .	9-1
9.1. Function of the Patrol . . . . .	9-1
9.2. Standard Patrol Work . . . . .	9-1
9.2.1. Refilling Cold Traps . . . . .	9-3
9.2.2. Checks of Hydrogen Supplies . . . . .	9-7
9.2.3. Procedures for Handling Gas Cylinders . . . . .	9-7
9.2.4. Checks of the 4500 Area Oxygen Supply . . . . .	9-8
9.2.5. Care in the Handling of Transfer Casks . . . . .	9-9

## PROCEDURE POLICY

It is necessary that the radioactive liquid and gaseous waste generated by this Laboratory be disposed of safely and efficiently. In order to accomplish this, the many individual operations associated with the disposal process must be performed in a like manner. These procedures define the correct manner for carrying out the individual operations and present a basis of information, founded on experience and prior knowledge, which will insure the overall job being accomplished with dispatch and in a manner least hazardous to the personnel or equipment concerned.

It is essential, therefore, that these procedures be followed at all times. This will insure consistent operation and reduce the human error to a minimum. If, in the judgment of the operating personnel, a procedure is incorrect or outdated, supervision should be so informed and any necessary revisions will be made.

Operating procedures are maintained current by formal issuance as conditions change. These procedures are categorized and issued accordingly:

1. Procedures of a temporary nature (those which may or may not become permanent but are of indefinite duration) are issued by the waste disposal supervisor under approval of the department superintendent and addressed to the Procedure Memorandum Book. Procedure Memoranda Books are located at the Waste Disposal Monitoring Center, Building 3105, and at the waste disposal supervisor's office.

The waste disposal supervisor is responsible for maintaining a current copy in his office and should periodically compare his copy against the Building 3105 copy to assure that the

books are up to date. As a procedure memorandum is outdated, it will be removed from the book and the procedure marked "void" on the Table of Contents listing.

2. New procedures of a permanent nature (those which describe permanent changes in operating conditions) are issued as required by the waste disposal supervisor, subject to approval of the department superintendent, and incorporated as permanent addition to the Operating Procedures. Such an addition will be located in the manual based on subject category.

If an existing portion of the procedures manual has become obsolete, that particular portion will be rewritten in its entirety. The obsolete section will be removed from the manual and the current procedure inserted. It is the responsibility of the waste disposal supervisor to maintain a current procedures manual.

3. Instructions to shift personnel are issued by the waste disposal supervisor or assistant as the need arises and are maintained current in the "Supervisor's Logbook". These instructions are of a temporary nature, are for a specified time, and will be removed and discarded after they have become obsolete.

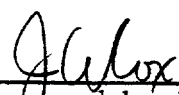
## 1. INTERMEDIATE LEVEL WASTE SYSTEM, BETHEL VALLEY


## 1.1. Intertank Transfer Procedures

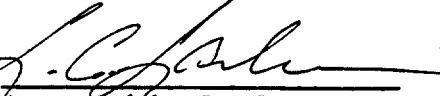
The group of tanks, WC-1 through WC-19, collects intermediate-level wastes from specific facilities; for example, WC-19 collects wastes from the LITR and ORR. Liquid level is indicated locally by a dial-type instrument, and a telemetered readout in Building 3105 keeps a record of all tank levels. When this record indicates that any tank has reached 60% of its capacity, an alarm will sound and the operator on duty will notify the tank farm operator of the fact. The contents of the tank are then pumped to W-5. After each transfer, caustic is added to the empty tank to insure that the contents remain basic for control of corrosion.

To transfer from WC-5, 6, 8, or 9 to W-5 or W-9 follow the procedure diagrammed in Table 1.1. To transfer from WC-10, 11, 12, 13, or 14 to W-5 or W-9, use Table 1.2. For intertank transfers within the tank farm or to the Evaporator Facility, refer to Table 1.3.

During the operation of the ILW Evaporator Facility, periodic transfers will be made from W-5 to Feed Tank A-1 in Building 2531. Detailed procedures for making this transfer are given in CF-64-11-63, Operating Procedures for the Intermediate-Level Waste Evaporator. It should be noted, however, that during these transfers, the flow of liquid through the line is monitored by an indicator light in Building 3105. If the condition of this light changes during the course of a transfer, the 3105 operator will notify the tank farm operator who will check the condition of the system.

  
Approved by J. A. Cox

  
Approved by E. J. Witkowski

  
Approved by L. C. Lasher

ORNL-DWG 65-3704

Table 1.1. Transfer Procedure, WC-5, 6, 8, 9 to W-5 or W-9

To Pump		Startup			Shutdown		
From	To	Open Valves	Turn On	Close Valves	Open Valves	Turn Off	Close Valves
WC-5 or WC-9	W-5	1. Prime water supply 2. Pump suction to tank being emptied 3. Pump discharge to tank being emptied	4. W-5 or W-9 Pump			2. W-5 or W-9 pump	1. Pump discharge to W-5 or W-9 3. Pump suction from tank being emptied 4. Prime water supply
	W-9	5. Prime water to pump suction. Pump will start circulating		6. Prime water to pump suction	5. Prime water drain		6. Prime water drain after 1 minute
WC-6 or WC-8	Metal Waste Only:	7. Pump discharge to W-5 or W-9		8. Pump discharge to tank being emptied			

Table 1.2. Transfer Procedure, WC-10, 11, 12, 13, 14, 15 to W-5 or W-9

ORNL - DWG 65-3703

To Pump		Startup			Shutdown		
From	To	Open Valves	Turn On	Close Valves	Open Valves	Turn Off	Close Valves
WC-11 -13	W-5	1. Main water supply (underground valve app. 100 ft. west of pump pit) 2. Prime water supply 3. Pump suction to tank being emptied 4. Pump discharge to tank being emptied	5. Pump in north pit for transfer to W-5; south pit for transfer to W-9			1. Transfer pump	2. Pump discharge to W-5 or W-9 3. Pump suction from tank being emptied 4. Prime water at pump suction 5. Prime water supply 6. Main water supply
	W-9	6. Prime water to pump suction. Pump will begin circulating 8. Pump discharge to W-5 or W-9		7. Prime water to pump suction 9. Pump discharge to tank being emptied	6. Prime water drain in pump pit		7. Prime water drain after 1 minute
or							
WC-10 -12 -14	W-9						
	W-5						
WC-14 may be used for temporary storage if W-9 has insufficient free space.							

WC-11 may be used for temporary storage if W-5 has insufficient free space.

WC-14 may be used for temporary storage if W-9 has insufficient free space.

Table 1.3. Transfers Within Tank Farm and to Evaporator Facility

ORNL -DWG 65-3705

To Pump Between	Startup			Shutdown		
	Open Valves	Turn On	Close Valves	Open Valves	Turn Off	Close Valves
W - 5 W - 6 W - 7 W - 8 W - 9 W - 10  Evaporator Facility, Building 2531	1. Water to pump supply line. Connect hose for supply. 2. Pump discharge to tank receiving transfer. 3. Pump seal water 4. Pump inlet water supply	5. Pump		1. Pump inlet water supply		2. Pump suction to tank being emptied 3. Inlet water supply after 1 minute
	6. Pump suction to tank being emptied		7. Pump inlet water supply. Check pump w/ survey meter to insure pumping.	6. Inlet water supply		5. Pump discharge to tank receiving transfer 7. Inlet water supply after 1 minute 8. Pump suction to tank being emptied 9. Water supply (hose line)
				10. Water drain valve 11. Pump head drain after disconnecting hose 12. Addition funnel valve		13. Addition funnel, pump head drain, and water drain after 30 minutes

1.1.1. To Jet W-1 to W-5

NOTE: W-1 is a collection tank even though it does not have a "WC" number.

The tank collects wastes from the radiochemical and contaminated waste systems, Figure 1.1 and Figure 1.2, of Building 3019. While the following procedure is for jetting W-1 to W-5, other tanks (WC-1, WC-2, WC-3, WC-4, and WC-19) are emptied by steam jet in a very similar procedure.

1. Check that the valve in the line labeled "from W-1 to W-5", in the concrete valve pit north of tank W-7, is open. This valve is tagged with an "open" sign and is to remain open at all times.
2. Open the valve labeled "W-5" at the Y on the northeast side of tank W-5.
3. Check that the valve labeled "W-6" is closed. It is normally closed as all transfers are to W-5.
4. Close the valve labeled "W-1 and W-2 to Xmas Tree" located at the north end of Building 3506. This valve shall be kept closed at all times.
5. Open the steam valve to the "W-1 to W-5" jet.
6. When the tank W-1 liquid level gauge shows that the tank is empty, close the steam valve to the "W-1 to W-5" jet.
7. Close the valve labeled "W-5" at the Y at the northeast side of tank W-5.

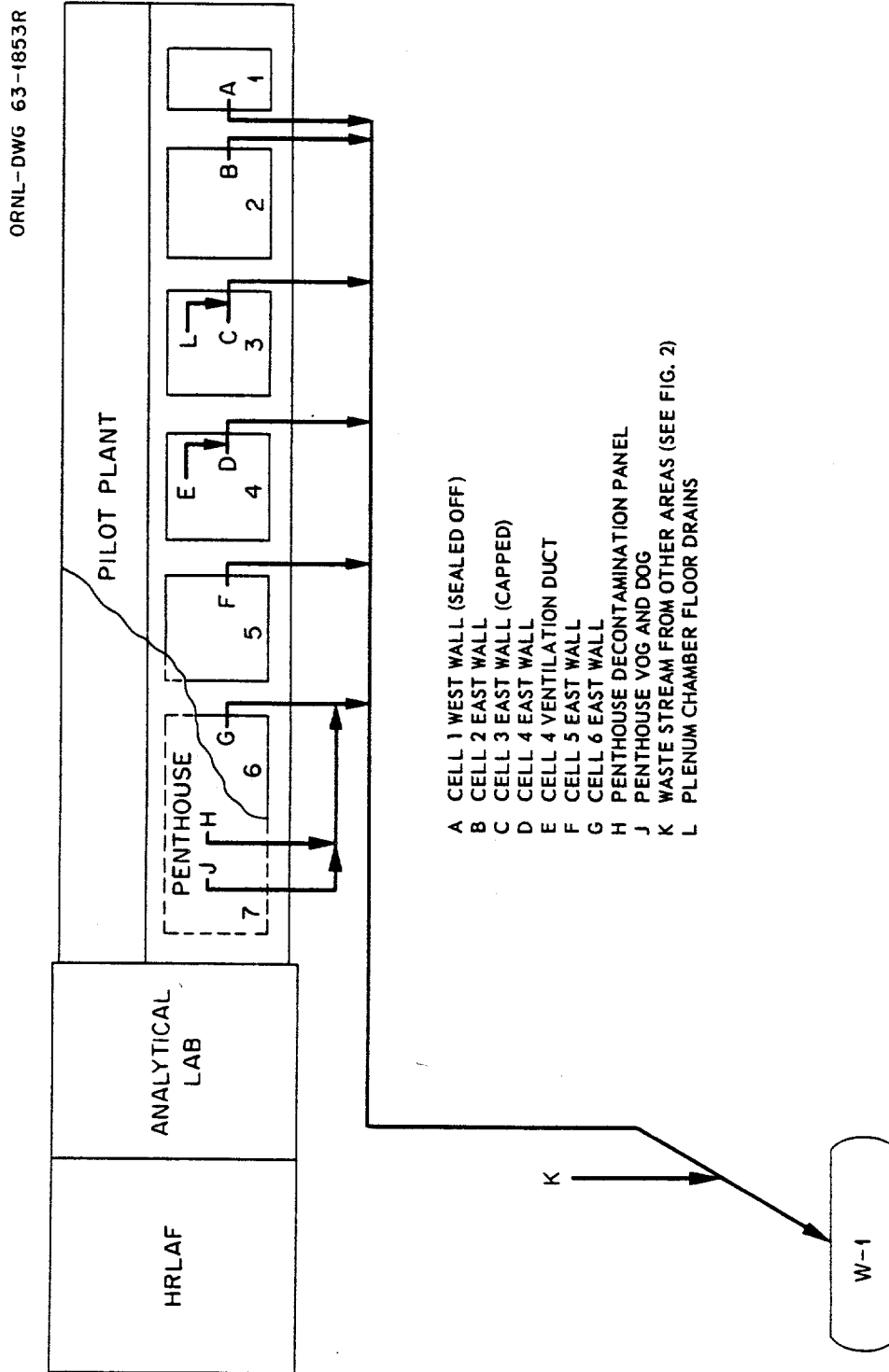
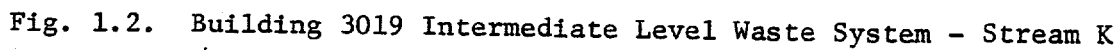


Fig. 1.1. Building 3019 Intermediate Level Waste System - Stream LL



## 1.2. ILW Neutralization



The principal control measure carried out in the operation of the ILW system is the periodic checking of the pH of the waste to insure that the tank contents are kept basic enough to combat corrosion.

Caustic (NaOH) for the neutralization of intermediate-level waste is kept in a caustic storage tank from which it can be valved directly to W-5 or W-6. Other tanks are supplied with caustic from a tank truck. Operators check the pH of all tanks once each shift and add caustic when it is needed. Also, when a collection tank is emptied to W-5, 5 to 50 gallons of caustic are added to the empty tank, usually on the 4-12 shift, so that inflowing waste will be kept basic.

1.2.1. To Check the pH of ILW in a Collection Tank

1. Open the valve below the sight glass in the sampler. Open the valve in the air line to the suction jet. Allow the waste solution to circulate through the sight glass for about 30 seconds and then close the valve below the sight glass. Open the valve immediately above the sight glass momentarily and then close.
2. Pour approximately 5 ml of phenol red indicator solution into the funnel at the top of the sampling assembly.
3. Open the valve below the funnel and allow the indicator solution to run into the tube below. Close the valve.
4. Open the valve immediately above the sight glass and allow the indicator to run into the sight glass. Note the resultant color of the mixture. If a red color persists, the waste solution is sufficiently basic, if the color becomes yellow

Approved By:

  
E. J. Witkowski  
L. C. Lasher

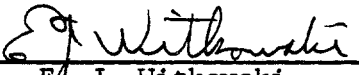
or colorless, the pH is 7 or below and caustic must be added.

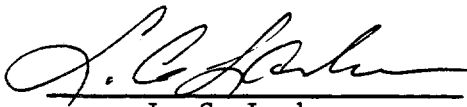
5. Turn off the air to the suction jet. Open the valve below the sight glass and drain the glass.

1.2.2. To Neutralize W-5 or W-6 from the Caustic Tank

1. Turn on the steam to the tracer line five minutes before opening the NaOH valve.
2. Check the NaOH liquid level. The float and gauge is located on the east side of the tank. (Tank is calibrated at about 54 gal/in.)
3. At least five minutes after the steam-to-tracer line is turned on, open the NaOH header valve located at the bottom of the tank on the west side.
4. Open the NaOH valve to W-5 and allow four inches of NaOH to flow into W-5.
5. Close the NaOH header valve.
6. Close the valve to W-5.
7. Close the steam valve to the tracer line.
8. To drain NaOH to W-6, follow the above procedure except open the steam valve to the W-6 tracer line and, after five minutes, open the NaOH valve to W-6.
9. Record the number of gallons drained to either tank in the tank farm logbook (54 gal/in.).
10. Wear rubber gloves and goggles.

Approved By:

  
E. J. Witkowski

  
L. C. Lasher

### 1.2.3. Operation of Caustic Truck

NOTE: ALL PRECAUTIONS FOR HANDLING NaOH SHOULD BE OBSERVED WHILE OPERATING THE TRUCK. FACE SHIELDS AND RUBBER GLOVES SHOULD BE KEPT IN THE TRUCK AT ALL TIMES AND ARE TO BE USED IN LOADING AND UNLOADING.

1. To fill the truck:

- a. Park the truck near the west side of the caustic storage tank.
- b. Check that the three vents on top of the truck are open.
- c. Check that the three 2-in. valves are open and both 1-in. valves are closed.
- d. Fasten one end of hose to the quick disconnect on the discharge side of pump and the other end to the quick disconnect on the back of truck.
- e. Close the pump drain valve.
- f. At the back of the truck open the valve which is connected to the pump.
- g. Open the valve on the discharge side of the pump.
- h. Open the valve on the inlet side of the pump.
- i. Check the NaOH tank liquid level. The float and gauge is located on the east side of the tank.
- j. Start the pump and transfer about 7 in. or 350 gal from the storage tank of the tank truck. While pumping, check to see that all compartments are filling equally.
- k. Shut off the pump.
- l. Close the pump inlet valve.

- m. Close the pump outlet valve.
  - n. Close the valve at the rear of the truck.
  - o. Open the drain valve from the pump.
  - p. Disconnect the pump hose from the truck and flush it with  $H_2O$ .
  - q. Move the truck to the W-5 pad and finish filling the tank with water.
2. Caustic addition to WC tanks
- a. Move the truck to the tank that needs NaOH.
  - b. Remove the hose from the rear of the truck and place the pipe nozzle in the gauge board addition hole or, in the case of WC-1, place the hose in the funnel at the jet pit and open the valve.
  - c. Open the valve at the truck and add the 50 gallons of NaOH to the tank.
  - d. Close the truck drain valve.
  - e. Drain the hose thoroughly.
  - f. Place the hose back on the truck hose rack.
  - g. Take the truck back to the tank farm steam line.
  - h. Connect the steam hose to the Chicago coupling. (Cold weather only.)
  - i. Turn on the steam to the tracer line.
3. To refill the caustic storage tank for the off-gas scrubber
- a. Park the truck above the storage tank.
  - b. Make the necessary hose connections (Chicago couplings) from the truck to the storage tank.

- c. Open the valve at the truck and fill the tank by gravity feed.

## 1.3. Transfer to Shale Fracturing

Storage tank W-8 is routinely pumped to the "T" tanks at the shale fracturing site (Figure 1.3). Proceed as follows:

1.3.1. Pumping Procedures

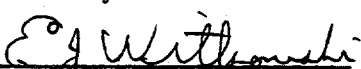
## 1. Pressure test the line as follows:


- a. Close the sample line valve and the pump head drain valve.
- b. "Deadhead" the transfer pump by closing the INLET valve located at the fracturing site valve pit.
- c. Open the valve on the discharge side of the pump.  
Pressurize the transfer line using prime water; a pressure of approximately 75 psi will be indicated.
- d. Close the discharge valve on the pump and then turn off the water.
- e. Observe the pressure gauge; it should read a minimum of 60 psi and remain constant for several minutes. If the indicated line pressure falls below this value, notify your supervisor. Do not start a waste transfer.

Otherwise, proceed with Step 2.

2. Open the valve at the shale fracturing site to whichever tank the waste is to be pumped.
3. Open the inlet valve to the pump from tank W-8.
4. Open the prime water valve to the pump inlet line.
5. Turn on the pump and see that pressure builds up on the gauge to above 40 psi.
6. Slowly open the discharge valve from the pump to the transfer line.

Approved By:

  
E. J. Witkowski

  
L. C. Lasher

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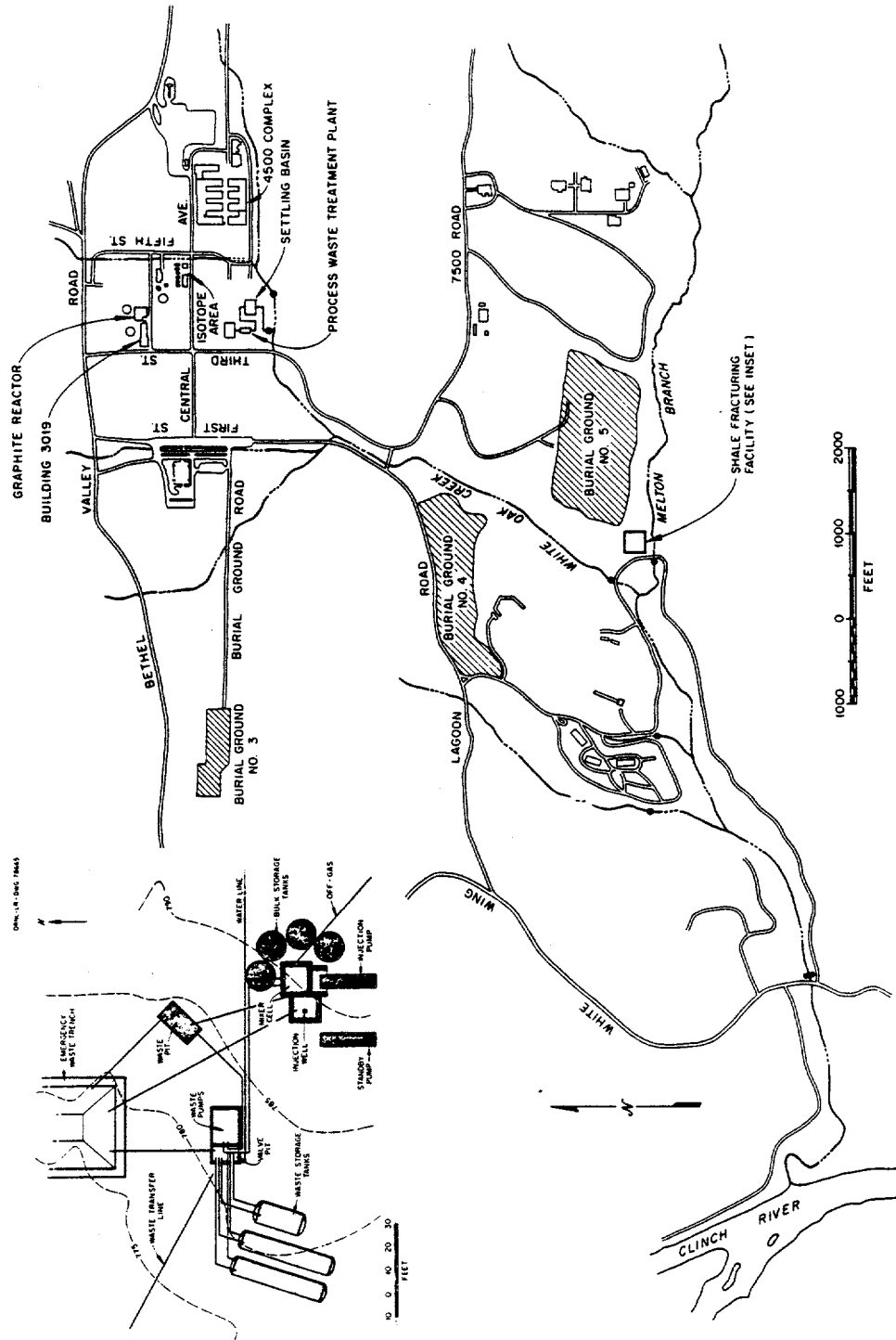



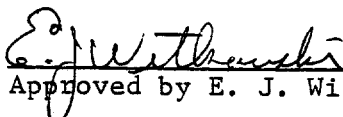
Fig. 1.3. Map of Bethel and Melton Valleys Showing the Location of the Shale Fracturing Facility

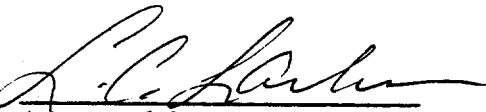
7. As the pump starts picking up, slowly shut off the prime water to the pump inlet line. Notify the operator in Building 3105 that the pump is running and determine that the light on the annunciator panel indicates this. The 3105 operator will notify the tank farm operator if the condition of this light changes during the course of a transfer.
8. Take a 10-ml composite sample from the sample line every four hours while making a transfer.

When pumping is completed, perform the following:

1. Close the inlet valve to the pump from tank W-8.
2. Open the prime water valve.
3. Run water from the prime water line through the pump to the tank for 60 minutes or until the discharge from the transfer pipe is clear, whichever is the longer.
4. Open the inlet valve to the pump from tank W-8.
5. Close the pump discharge valve to the waste disposal area.
6. Shut down the pump; notify the operator in Building 3105 of this action.
7. Close the prime water valve.
8. Close the pump seal water line valve.
9. Disconnect the water hose.
10. Open the prime water line drain valve.
11. Open the pump head drain valve.
12. Close the inlet valve to the pump from tank W-8.
13. Jet the pit sump to W-8 if necessary.

  
Approved by J. A. Cox

  
Approved by E. J. Witkowski

  
Approved by L. C. Lasher

## 2. PROCESS WASTE SYSTEM, BETHEL VALLEY

## 2.1. Tributary Control System

The control of process waste discharges into the system is accomplished through monitoring of the main streams. The monitoring equipment in each of the streams measures continuously the flow and activity and takes a sample proportional to the flow.

Local Stations (Manholes) - Each station is equipped with:


1. A "V" notch weir and flow recorder which transmits to a remote recorder in Building 3105.
2. A count-rate meter, detector, and shield assembly which continuously measures the radiation level and transmits it to a recorder in Building 3105.
3. A proportional sampler.
4. A submersible pump in the manhole which pumps a stream of waste water continuously through the monitoring equipment.

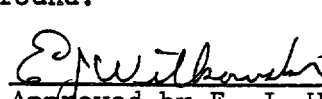
The 24-hr proportional sample is available for analysis at any time but it is normally used only for the monthly composite. A 10-ml aliquot of the monthly composite is run for gross alpha and gross beta at 2026 Lab. If the count-rate meter should become inoperative, it may be necessary to take periodic samples from the proportional sample. Supervision will determine when this is necessary.

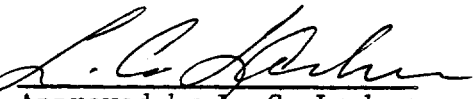
Operators record readings in Building 3105 each hour and check manhole stations at least once each shift as follows:

Tank Farm Operator

1. Decontaminate the detector heads as necessary to maintain a minimum background.

  
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2. Add a 100-ml aliquot of the 24-hr proportional sample to the monthly composite at the 10:00 a.m. shift check. The 24-hr proportional sample, if needed, and the monthly composite, analyzed at the end of each month for gross beta, serve for both control and activity inventory purposes.

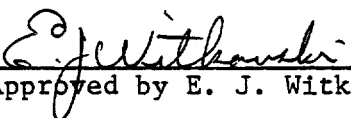
Building 3105 Operator

1. Operate all count-rate meters at a range which keeps the readout on the process waste activity recorders below 30%.
2. Maintain a minimum background. Notify the tank farm operator when decontamination of a shield and detector is necessary. If other maintenance is necessary, advise the assigned I&C technician of the difficulty.
3. Record hourly the activity level and flow rate at each monitoring station.
4. Investigate all activity releases which cause an increase in level 2000 counts/min above background.

Proceed as follows:

- a. Telephone the area supervisor (see Table 2.1). Inform him of the status of the waste system and request his cooperation in locating the source.
- b. Notify your supervisor if the station has not cleared (decreasing activity) within 30 minutes. In addition, have the tank farm operator check the station and pick up the composite sample for identification. The local audible signal will differentiate between mechanical failure and radiation.

  
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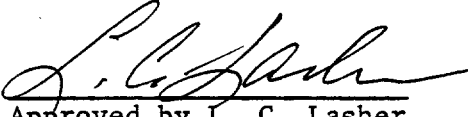
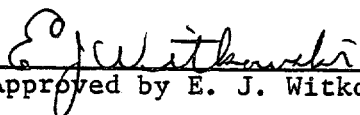
  
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Table 2.1. Area Representatives to Call in Event of  
Release to the PW or Gaseous Waste Disposal Systems

<u>Point of Activity Detection</u>		<u>Area</u>		<u>Representative</u>	<u>Telephone</u>
<u>Process Waste</u>	<u>Gaseous</u>	<u>Responsibility</u>	<u>Reactor Area</u>		
MH-114	ORR Building & CV				
	ORR Pressurizable OG	ORR		W. H. Tabor	3-6451
	Central OG			S. S. Hurt	3-6451
				Shift Engineer	3-6451
MH-234	Isotopes Area CV		<u>Isotopes Area</u>		
	Central OG		Bldg. 3028 - Iodine	R. W. Schaich	3-1131
			Processing & Source Fabrication		3-1936
			Bldg. 3029	J. A. Setaro	3-1131
			Bldg. 3030-31		3-6314
			Bldg. 3032-33		3-1151
			Bldg. 3037		3-1131
			Bldg. 3037		3-1131
			Bldg. 3047		3-1640
			Bldg. 3047	E. E. Pierce	3-1640

  
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Approved by E. J. Witkowski

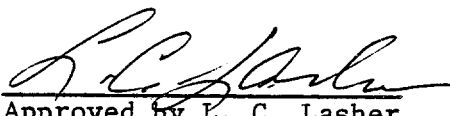
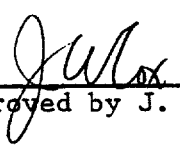
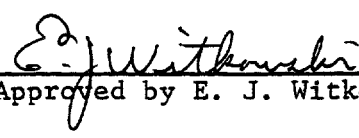
  
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Table 2.1. (Continued)

Point of Activity Detection		Area Responsibility	Representative	Telephone
Process Waste	Gaseous			
MH-190	4500 Area CV	<u>4500 Complex</u>		
	Central OG	Bldg. 4500	J. W. Loy	3-6203
		Bldg. 4501	G. W. Parker	3-6366
	4500 Area CV	Bldg. 4505	M. E. Whatley	3-6272
	Central OG	Bldg. 4507	J. R. Flanary	3-1120
		Bldg. 4507	V. C. A. Vaughn	3-6987
		Bldg. 4507	Jerry Goode	3-6332
			F. N. Browder (RCO)	3-6951
	3500 Area CV	<u>3500 Area</u>		
MH-209	Central OG	Bldg. 3517	C. L. Ottinger	3-6971
MH-229		Bldg. 3503	F. L. Daley	3-6282
		Bldg. 3508	R. E. Leuze	3-6073
MH-149		Bldg. 3525	E. M. King	3-1672
		Bldg. 3525	R. L. Lines	3-1672
			C. A. Golden (Area HP)	3-6581

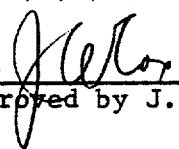
  
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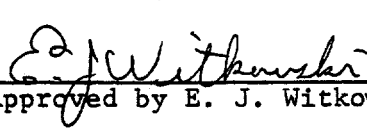
  
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Table 2.1. (Continued)

Point of Activity Detection	Area		Representative	Telephone
	Process Waste	Responsibility		
MH-149	Bldg. 3025-26 CV	Bldg. 3025	A. A. Walls	3-6234
	Central OG	Bldg. 3025	E. M. King	3-1672
		Bldg. 3026-C	K. W. Haff	3-6258
		Bldg. 3026-C	Technician	3-6011
		Bldg. 3026-D	A. A. Walls	3-6234
		<u>Bldg. 3019</u>		
MH-25	3020 Stack	Pilot Plant	R. E. Brooksbank	3-6756
		Pilot Plant	R. Shannon	3-6756
		Analytical	E. I. Wyatt	3-6876
			Lab Supervisor	3-6525
Monitoring Box No. 1 (HFIR Tower)	HFIR Stack	HFIR	Shift Engineer	3-1581
	HFIR Duct	Bldg. 7900		
Monitoring Box No. 2 (HFIR Process)				



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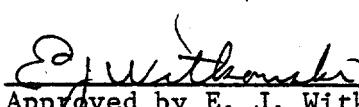

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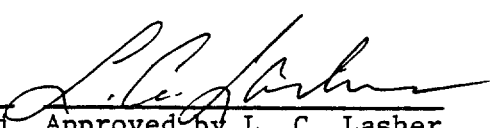

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Table 2.1. (Continued)

Monitoring Box No. 3 (TRU)	Point of Activity Detection		Area		Telephone
	Process Waste	Gaseous	Responsibility	Representative	
		HFIR Stack	TRU,	Shift Engineer	3-1872
		TRU Duct	Bldg. 7920		
		MSRE Stack	MSRE,	Shift Engineer	3-6089
			Bldg. 7503		

  
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c. Log the following information:

- (1) Time and magnitude of activity reading.
- (2) Indicated flow.
- (3) Duration of incident.
- (4) Source.

5. Notify your supervisor immediately if any monitor reads off scale on the 25 K range.

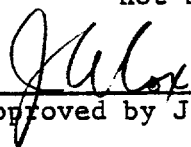
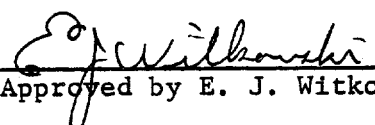
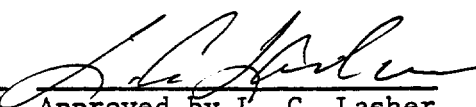
## 2.2. Diversion Box

The process waste tributaries converge at a monitoring and valving station called the diversion box. Instrumentation at this station records, both locally and remotely in Building 3105, flow rate and volume, pH, and radiation level. Switches in the radiation monitors operate a valving system which sends the waste either to the Settling Basin (for no treatment) or to the Equalization Basin (for treatment). With the valving system in the "automatic" mode, waste reading below a point set at approximately background is sent to the Settling Basin and waste reading above that point is valved to the Equalization Basin. Normally, the system is operated "manually", sending all waste to the Equalization Basin for processing. Diversion to the Settling Basin is used only if the flow exceeds the capacity of the Waste Treatment Plant or if the treatment plant is shut down for maintenance or other reasons.

At 10:00 a.m. daily, a 10-ml aliquot is taken from the proportional sample and delivered to the Analytical Laboratory in Building 2026 for gross alpha and gross beta analysis. A gross alpha analysis is made every 4 hrs. The balance of the sample is added to the monthly composite.

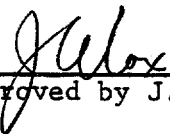
Building 3105 operator will monitor the diversion box as follows:

1. Operate this station at minimum range.
2. Maintain a minimum background. Request decontamination or maintenance as needed.
3. One thousand counts/min beta gamma or 200 counts/min alpha, above background, is considered significant. If the condition has not cleared itself within 30 min and the source of trouble has not been located, perform the following:

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- a. Notify your supervisor.
- b. Have the tank farm operator check the station for proper operation and collect all tributary composite samples (dip sample from Pumping Station No. 1) and the diversion box grab sample. Deliver 15 ml to the laboratory for gross-beta analyses; hold the remainder.
- c. Log the following information:
  - (1) Time and magnitude of discharge.
  - (2) Indicated flow.
  - (3) Duration of incident.
  - (4) Source.

The balance of the sample is added to the monthly composite.

  
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## 2.3. Other Monitoring Stations

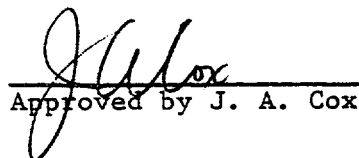
Pumping Station No. 1 -- This station is a sump that collects seepage from the North and South Tank Farm areas. The seepage is then pumped into the Equalization Basin. Radiation level only is monitored at the station and recorded in Building 3105 on a Rustrak recorder. Operators check the station daily. A sharp rise in radiation level at this point could indicate a leaky storage tank. If such a rise does occur, take a sample and notify your supervisor.

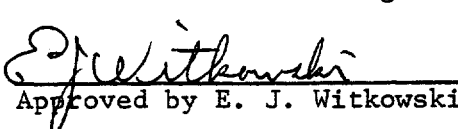
Fifth Street Water Monitor -- A radiation monitor is located southeast from Bldg. 3500 where stream enters tile. Readout from the count rate meter is telemetered to Building 3105 and recorded on a Rustrak recorder. Operators check the station daily. Any increase in activity seen here is significant; notify your supervisor. Take a sample and deliver to the Analytical Laboratory, Building 3019, for identification of activity.

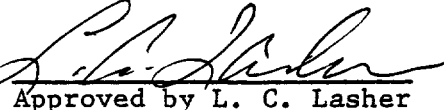
The Flume Station -- This station, east of the Settling Basin, monitors both flow and radiation level. Radiation level is recorded in Building 3105 on a Rustrak recorder. As above, if an activity increase is seen, take a sample and notify your supervisor.

Sewage Treatment Plant -- Effluent from the Sewage Treatment Plant is monitored for radiation level with telemetering to Building 3105. Operators check the station daily. If an increase in activity is seen, take a sample and notify your supervisor.

7500 Road Bridge -- This station on White Oak Creek is downstream from the discharge streams of both the Settling Basin and the Sewage Treatment Plant. It is a radiation-monitoring station. Remote radiation

  
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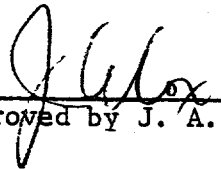
  
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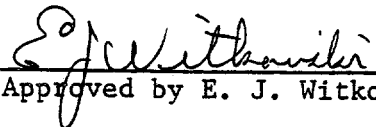
level readout in Building 3105 is on a Rustrak recorder. Operators check the station each shift. If an increase in activity is seen at this station, take a sample and notify your supervisor.

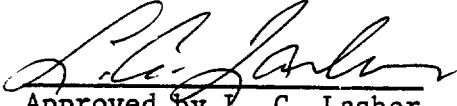
Mobile Monitoring Station -- This station is used to help find sources of activity discharge that are difficult to find by normal methods. This station is normally installed southwest of the shale fracturing facility on White Oak Creek. Radiation readings are telemetered to Building 3105. The station is moved successively upstream along any branch of the system until it indicates the point of activity discharge. In the event of an activity increase, take a sample and notify your supervisor.

Disposal Area -- Flow and sampling stations are located on Melton Branch, White Oak Creek, and the White Oak tributaries. Flow is recorded locally only. Operators check the stations daily, usually in the morning. The procedure for each station is as follows:

1. Pour the total proportional sample into the monthly composite (located at 3518 basement).
2. Check the operation of the proportional pump.
3. Note the integrated flow reading and record on the tank farm shift check list.
4. Ink the recording pen on the flow recorder.
5. Change the flow charts weekly.

  
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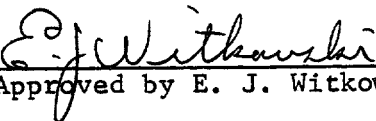
## 2.4. Equipment Maintenance

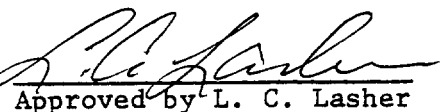
Equipment failures are to be repaired as rapidly as possible; notify your supervisor of all breakdowns. Monitors on the Diversion Box, the White Oak Creek stations, the Sewage Treatment Plant, the Melton Branch station, the 4500 Process Waste stream, and the Tank Farm drainage to the Equalization Basin are considered vital and must be maintained in proper operating condition at all times. For service on 4-12 or 12-8 shifts or on weekends or holidays, contact the following:

John D. Blanton, Oak Ridge, 483-1049, or

Clyde Moree, Fountain City, 689-5414

  
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## 2.5. Waste Treatment Plant

At least one operator on each shift is responsible for the operation of the Tank Farm, Disposal Area, and the Waste Treatment Plant. While the mechanical operation of the plant is automatic, equipment checks and water analyses are made according to the following procedures (see Figure 2.1).

### 2.5.1. Shift Checks - All Shifts

1. Check that all valves are set correctly.
2. Check that all equipment is operating properly; motors and gear boxes are not overheating.
3. Check the liquid level of the Equalization Basin.
4. Check that the feeder alarm switches are on and that the alarms will operate. Contact the Building 3105 operator and see that the equipment ON/OFF lights at that location are indicating correctly. If during the shift a light changes causing an alarm, the Building 3105 operator will inform the tank farm operator of a possible equipment failure.
5. Check that the oil cups on the sump pumps, sludge pumps, and the feed pumps are full.
6. Check that the chemicals are not plugging the screens under the feeders.
7. Check that the water is on both mixing boxes to the feeders being used.
8. Check that water is flowing through the rotameters for the flow-control instruments. Keep the float about half scale.
9. Keep the building and area clean.

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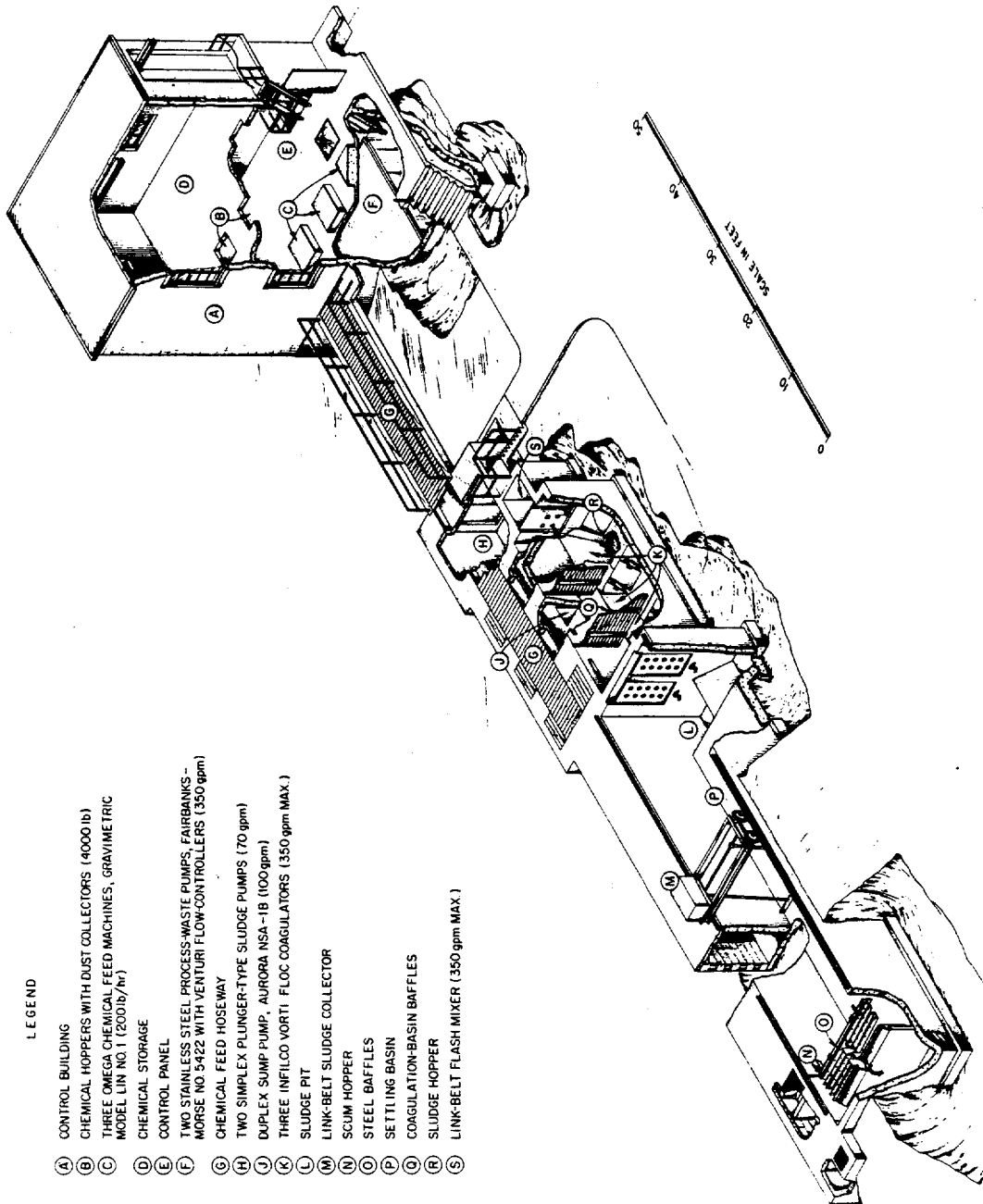


Fig. 2.1. Process Waste Treatment Plant, Building 3518

2.5.2. Special 8-4 Shift Checks

1. Drain off the sludge, pump to the waste trailer and transfer to Waste Pit No. 4 as necessary. (See Procedures for Sludge Removal, Section 2.6.)
2. Keep a supply of plastic bags to cover the drain line on the waste trailer. A new bag is to be used each time the trailer is unloaded.
3. Open the drain valve for the air filter in the chemical hopper dust collector and drain out the condensate.

2.5.3. Procedures for Valving Process Waste through the Waste Treatment Plant

1. In the process pump basement:
  - a. Close valve No. 1 labeled "Equalization Pond to Process Pumps".
  - b. Close valve No. 2 labeled "Recirculation to Process Pumps".
  - c. Close valve No. 5 labeled "Untreated Waste to Storm Drain".
  - d. Close valve No. 4 labeled "Treated Waste Recirculation to Process Pump No. 1".
  - e. OPEN valve No. 3 labeled "Inlet Valve to Process Pump No. 1".
  - f. Close valve No. 6 labeled "Inlet Valve to Process Pump No. 2".
  - g. Close valve No. 7 labeled "Treated Waste Recirculation to Process Pump No. 2".

- h. Close valve No. 8 labeled "Untreated Waste to Storm Drain or Process Pumps".
  - i. OPEN valve No. 9 labeled "Process Pump No. 1 Outlet".
  - j. OPEN valve No. 10 labeled "Process Pump No. 1 to Flash Mixer".
  - k. OPEN valve No. 11 labeled "Process Pumps to Flash Mixer".
  - l. Close valve No. 12 labeled "Process Pump No. 2 to Flash Mixer".
  - m. Close valve No. 13 labeled "Process Pump No. 2 Outlet".
  - n. Turn on water to Venturi flow controller to a flow rate determined by supervision.
  - o. Turn on water to process pump seal.
  - p. OPEN valve No. 1 labeled "Equalization Pond to Process Pumps".
  - q. Turn on the switch to process pump No. 1
2. In the mixing and settling chamber area
- a. OPEN valve No. 39 labeled "No. 1 Chemical Feeder to Flash Mixer".
  - b. Close valve No. 40 labeled "No. 2 Chemical Feeder to Flash Mixer".
  - c. OPEN valve No. 41 labeled "No. 3 Chemical Feeder to Flash Mixer".
  - d. Close valve No. 42 labeled "No. 1 Chemical Feeder to No. 1 Coagulator".
  - e. Close valve No. 43 labeled "No. 2 Chemical Feeder to No. 1 Coagulator".

- f. Close valve No. 44 labeled "No. 3 Chemical Feeder to No. 1 Coagulator".
- g. Close valve No. 45 labeled "No. 1 Chemical Feeder to No. 2 Coagulator".
- h. Close valve No. 46 labeled "No. 2 Chemical Feeder to No. 2 Coagulator".
- i. Close valve No. 47 labeled "No. 3 Chemical Feeder to No. 2 Coagulator".
- j. Close valve No. 48 labeled "No. 1 Chemical Feeder to No. 3 Coagulator".
- k. Close valve No. 49 labeled "No. 2 Chemical Feeder to No. 3 Coagulator".
- l. Close valve No. 50 labeled "No. 3 Chemical Feeder to No. 3 Coagulator".
- m. Close valve No. 37 labeled "Treated Waste to Sludge or Process Pumps".
- n. Close valve No. 38 labeled "Weir Box Drain".
- o. Turn on both motors to the link belt sludge collector.  
Set regulating switches "Automatic".

WARNING: Do not touch the limit switches.

- p. Turn on motors to all three coagulators. Turn the control wheel one cycle and then adjust it to maximum speed.
- q. Turn on the motor to the flash mixer.
- r. Set valves No. 35 and 36 (Sludge Hoppers No. 1 and No. 2 to sludge pit) according to instructions from supervision.

#### 2.5.4. Procedures for Water Analysis

##### 1. Mixing Reagents

Normally the reagents for water analysis will be provided by the Analytical Chemistry Division. However, in the event this source is not available, they may be prepared as follows:

- a. Versene - Dissolve 4.0 gm of reagent grade disodium ethylenediamine tetracetate and 0.10 g of  $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$  in 800 ml of distilled water. Standardize against a standard calcium solution so that 1.00 ml is equal to 1.00 ml/mg  $\text{CaCO}_3$  as nearly as possible.
- b. Chrome Black "T" Indicator - Dissolve 0.5 g of Chrome Black "T" in 100 ml of 60 to 80% ethyl alcohol.
- c. Inhibitor "B" - Dissolve 5.0 g of  $\text{Na}_2\text{S} \cdot 9\text{H}_2\text{O}$  in 100 ml of distilled water.
- d. Buffer Solution - Dissolve 67.5 g of  $\text{NH}_4\text{Cl}$  in 570 ml of concentrated  $\text{NH}_4\text{OH}$  and dilute to 1 liter with distilled water.
- e. Ammonium P Indicator - Suspend 50 mg of ammonium purpurate in 50 ml of absolute ethyl alcohol.
- f. Sodium Hydroxide Solution - Dissolve 80 g of  $\text{NaOH}$  in 800 ml of distilled water. Cool and dilute to 1 liter (1000 ml).
- g. Hydrochloric Acid Solution, 0.02 N - Dilute 20 ml of 1 N  $\text{HCl}$  to 1 liter for a 0.02 N acid solution.
- h. Methyl Orange Indicator - Dissolve 5.0 g of methyl orange in 1 liter of distilled water.

- i. Phenolphthalein Indicator - Dissolve 5.0 g of phenolphthalein in 500 ml of ethyl alcohol and add 500 ml of distilled water. Add 0.02 N NaOH dropwise until a faint pink color appears.

## 2. Total Hardness Test

- a. Influent - Dilute 25 ml of influent sample to 50 ml with distilled water in a beaker. Add 1 ml of buffer solution and mix. Add 1 ml of inhibitor B and 2 drops of chrome black T indicator and mix. Add the versene slowly with continuous stirring until the last reddish tinge disappears from the solution, adding the last few drops dropwise at 3 to 5-second intervals.
- b. Effluent - Place 50 ml of filtered effluent sample in a beaker. Add 1 ml of buffer solution and mix. Add 1 ml of inhibitor B and 2 drops of chrome black T and mix. Add the versene slowly with continuous stirring until the last reddish tinge disappears from the solution, adding the last few drops at 3 to 5-second intervals.
- c. Calculations -

### Influent

$$\begin{aligned}\text{Total hardness as mg/l of CaCO}_3 &= \frac{\text{ml of versene} \times 1000}{25} \\ &= \text{ml of versene} \times 40\end{aligned}$$

### Effluent

$$\begin{aligned}\text{Total hardness as mg/l of CaCO}_3 &= \frac{\text{ml of versene} \times 1000}{50} \\ &= \text{ml of versene} \times 20\end{aligned}$$

## 3. Calcium Hardness (EDTA)

- a. Influent - Dilute 25 ml of influent sample to 50 ml with distilled water in a beaker. Add 1 ml of sodium hydroxide (NaOH) solution while mixing to avoid local excess. Add 5 drops of ammonium P indicator and stir. Add the versene slowly with continuous stirring until the color changes from pink to purple. Check the end point by adding 1 or 2 more drops of titrant; no further color change should occur.

CAUTION: The titration MUST be completed within 5 minutes from the time of adding the sodium hydroxide.

- b. Calculations -

Influent

Calcium hardness as mg/l of  $\text{CaCO}_3$  =

$$\frac{\text{ml of titrant} \times 1000}{50} \times \text{Lime Factor (Table 2.2)}$$

## 4. Alkalinity Procedure

- a. Phenolphthalein Alkalinity - Add 2 drops phenolphthalein indicator to a sample of suitable size, 50 or 100 ml if possible, in a beaker. Titrate over a white surface with 0.0200 N standard HCl acid to the proper equivalence point of pH 8.3.
- b. Methyl Orange or Bicarbonate Alkalinity - Add 2 drops of methyl orange indicator to the solution in which the phenolphthalein alkalinity has been determined, or to a sample of suitable size, 50 or 100 ml if possible, in a beaker. Titrate over a white surface with 0.0200 N

standard HCL acid to the proper equivalence point. The indicator changes to orange at pH 4.6 and pink at 4.0.

c. Calculation

Phenolphthalein alkalinity as ml/l  $\text{CaCO}_3$  =

$$\frac{\text{ml standard acid} \times 1000}{\text{ml sample}}$$

Total alkalinity as mg/l  $\text{CaCO}_3$  =

$$\frac{\text{total ml standard acid} \times 1000}{\text{ml sample}}$$

CAUTION: If total alkalinity is determined on the same solution used for phenolphthalein alkalinity, be sure to include the volume of acid required for the phenolphthalein titration in the "total ml standard acid".

#### 2.5.5. Chemical Feed Calculations

1. Calculate the soda ash feed rate from the following expression:

$$(\text{Total Hardness} - \text{Total Alkalinity}) \times \text{Soda Ash Factor} + \text{Excess Soda Ash} = \text{Feed Rate (lbs/hr)}$$

The Soda Ash Factor is obtained from Table 2.2 and is dependent on the flow rate through the system.

2. Lime feed rate in pounds per hour

- a. Determine the bicarbonate alkalinity

(See Alkalinity Procedure 4.b.)

- b. Determine the free  $\text{CO}_2$  as follows:

Using the chart (Figure 2.2), follow the pH curve and the bicarbonate curve to the point where the curves cross.

Multiply this figure (free  $\text{CO}_2$  in ppm) by 2.28.

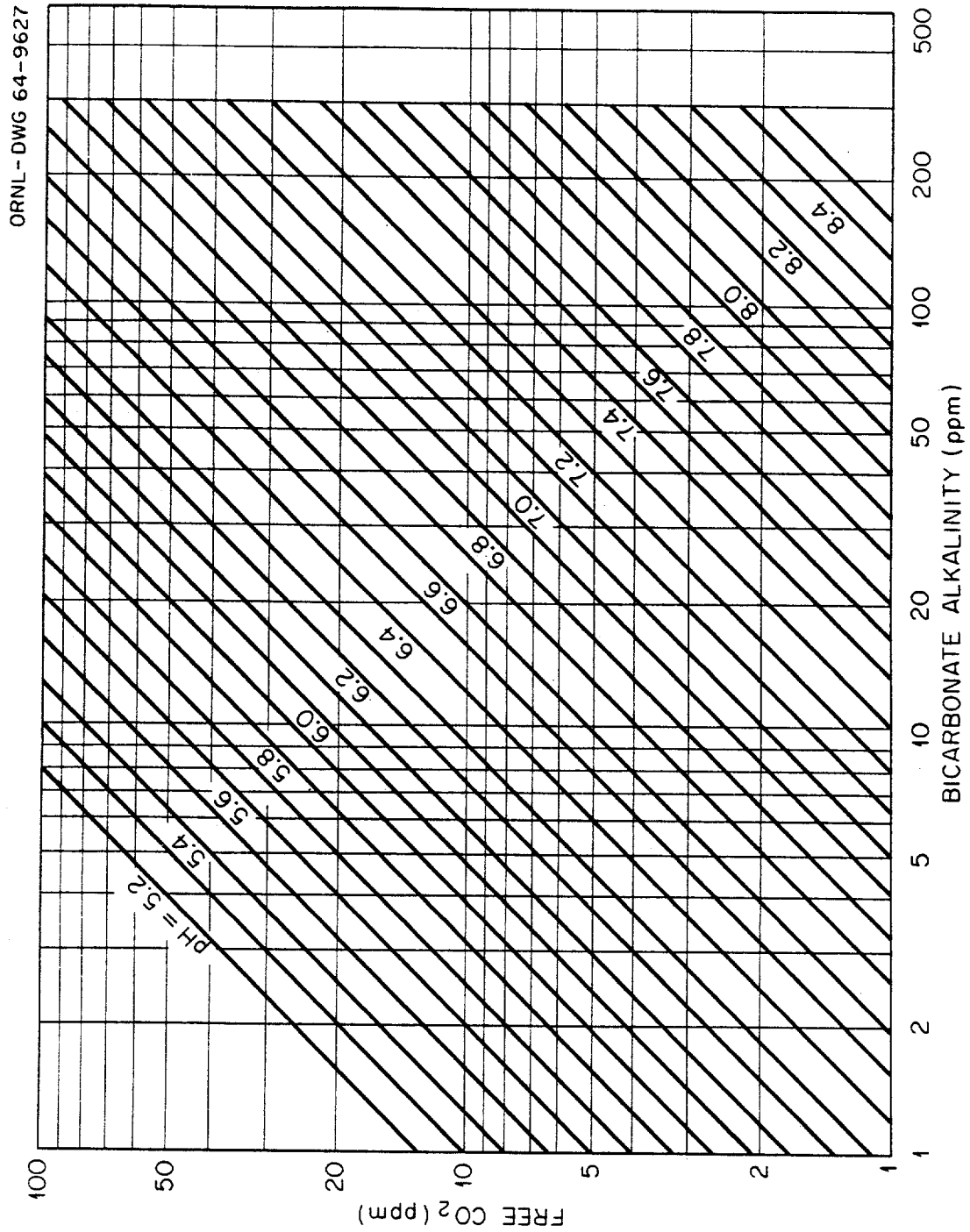


Fig. 2.2. Hardness Curves Used to Determine Free CO<sub>2</sub> in Process Water

- c. Determine the magnesium hardness by subtracting the calcium hardness from the total hardness.
  - d. Add the results of a, b, and c; multiply their sum by the appropriate factor from Table 2.2 and divide by .95 to adjust for the purity of lime. This is the lime feed rate in pounds per hour.
3. No calculations are necessary for clay; take this feed rate directly from Table 2.2.

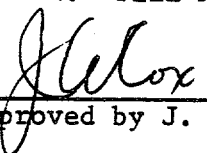
Table 2.2. Chemical Feed Calculations

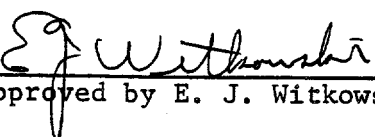
Rate of Waste Treatment Gals per Min	Lime Factor	Soda Ash Factor	Soda Ash Lbs Excess	Lbs Clay
250	0.10	0.13	25	25
300	0.11	0.16	30	30
330	0.12	0.18	33	33
350	0.13	0.19	35	35

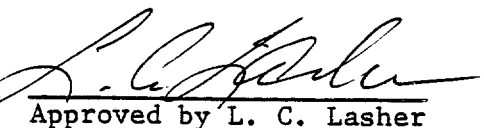
#### 2.5.6. Procedures for Operating Chemical Feed Machines

The hoppers for the chemical feed machines are filled on the 12-8 shift, as needed, to keep the weight of chemical between 500 lb and 4800 lbs. Procedures for filling the hoppers are as follows:

1. Notify the operator in Building 3105 that one or more chemical feeders will be shut down for filling.
2. Check that the doors to the dust collectors are closed tight.
3. Turn on the switches to the dust collectors of all hoppers that are to be filled.
4. Fill No. 1 hopper with lime.

  
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5. Fill No. 2 hopper with soda ash.
6. Fill No. 3 hopper with clay.
7. Turn off the switches to the dust collectors when finished.

To start the feeder machines:

1. Balance the counter poise at "0".
2. Close the drain valve.
3. Open the water valve. When the tank fills, regulate the valve for constant level.
4. Turn on the switch to the mixer.
5. Turn on the switch to the oscillator motor.
6. Turn on the switch to the syntron vibrator.
7. Turn on the rate setter switch and set the dial at the rate determined by calculation (or as shown in Table 2.2).
8. Turn on the lights and the alarm switch; notify the operator in Building 3105 that the equipment is back in service.

#### 2.5.7. Waste Treatment Plant Effluent

The effluent from the waste treatment plant can either be discharged to White Oak Creek or pumped to the Settling Basin. Normally it is pumped to the Settling Basin for clarification before being discharged into White Oak Creek.

This discharge from the Settling Basin is monitored for volume and a proportional sample is collected for 24 hours. Each morning (10:00 a.m.) 25 ml of the proportional sample is taken to the lab in Building 2026 for gross-alpha and gross-beta analysis. The balance of the sample is added to the monthly composite.

## 2.6. Procedures for Sludge Removal

Once each shift, 9:00 a.m., 5:00 p.m., and 1:00 a.m., drain the sludge from the hopper to the sludge pit as follows:

1. Check that all valves in the basement are closed.
2. Open the valve to sludge hopper No. 1.
3. Open the valve in the basement to the sludge pit until the liquid level of the pit rises three inches. Move the measuring float up and down during the process to be sure it doesn't hang.
4. Close the valve to the sludge pit.
5. Close the valve from the sludge hopper.
6. Record the number of inches received from hopper No. 1 on the back of the Waste Treatment Plant data sheet.
7. Repeat the above procedure for hopper No. 2.
8. After the drain off is completed, open the valve in the basement to the sludge pit and drain for 5 min, then close the valve.
9. If the liquid level of the sludge pit does not increase, set the valves to and from the pump and pump the sludge from the hopper. Use either the north or south recirculating lines for the discharge into the sludge pit. After the valve from the hopper is closed, drain the pump by opening the large valve to the sludge pit for 5 min, then close all valves.

### 2.6.1. Pumping of Sludge from Pit to Trailer

1. Park the waste trailer at the loading platform and open the vents.
2. Insert the loading arm into the trailer and secure.

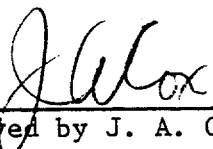
3. Check that the oiler cup to the sludge pump is full of oil and that it is adjusted to 3 drops per minute.
4. OPEN valve No. 22 labeled "Suction Leg to Sludge Pumps".
5. Close valve No. 21 labeled "Recirculating Valve to Sludge Pumps".
6. Close valve No. 23 labeled "Suction Leg to Sludge Pump No. 2".
7. OPEN valve No. 20 labeled "Suction Leg to Sludge Pump No. 1".
8. OPEN valve No. 25 labeled "Outlet Valve from Sludge Pump No. 1".
9. Close valve No. 31 labeled "Sludge Pump No. 1 Drain Valve".
10. Close valve No. 26 labeled "Sludge Pump No. 1 to Sludge Pit".
11. Close valve No. 28 labeled "Sludge Pump to Flash Mixer".
12. Close valve No. 29 labeled "Sludge Pump No. 2 to Sludge Pit".
13. Close valve No. 30 labeled "Sludge Pump No. 2 Outlet".
14. OPEN valve No. 27 labeled "Sludge Pump to Waste Trailer".
15. Turn on the switch to sludge pump No. 1.
16. Watch visually the filling of the waste trailer and, if necessary, the sludge pump can be stopped with the auxiliary switch which is located on the northeast corner outside the sludge pump basement.
17. When pumping to the waste trailer is finished, cut off the pump and close valves numbered 22, 20, 25, and 27.
18. Turn down the oiler cup adjustment on the sludge pump.
19. Cover the loading arm with a plastic bag to prevent drippage.

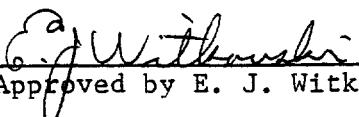
2.6.2. Sludge Trailer Transit

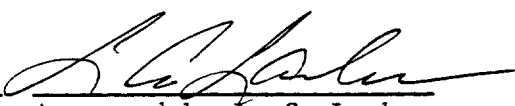
1. Prior to moving the loaded trailer:
  - a. Secure the manhole cover.
  - b. Cover the discharge spout with a plastic bag.
2. While the sludge is being transported to the disposal area, the trailer should be followed by an operator in a pickup truck. The trailer should be observed closely while in transit, and at the first indication of an abnormal condition, the trailer should be halted. In the event a spill should occur, the following steps should be taken:
  - a. Rope off the area.
  - b. Inform your supervisor of the situation.
  - c. Contact the Applied Health Physics office, Phone 3-1692.
  - d. Initiate cleanup activities.

## 2.7. Emergency "Hold Up" Pond

1. The Building 3105 operator will notify the supervisor if the diversion box indicates a radiation level of  $20,000 \text{ counts min}^{-1} \text{ ml}^{-1}$  or greater.
2. If the supervisor advises shutting down the Waste Treatment Plant, proceed as follows:
  - a. Close both inlet valves.
  - b. Stop feed pumps.
3. Instructions to start a transfer to the emergency pond will be given by the supervisor. To start the transfer, proceed as follows:
  - a. The inlet valves to the treatment plant feed pumps should be closed.
  - b. Open the inlet and discharge valves to the emergency pump; start the pump. This equipment is located in the Waste Treatment Plant basement. If the pump is operating properly, the discharge pressure should be approximately 115 psig.
  - c. The discharge line at the pond should be checked to be certain the system is operating properly.
  - d. See that the valves located at Valve Pit No. 1 (east of Waste Treatment Plant) and Valve Pit No. 2 (near 7500 Road Bridge) are properly positioned for the transfer.

  
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## 2.8. 4500 Area Process Waste Ponds

Two 150,000-gal ponds, located east of the Settling Basin, are used to catch and divert inactive process waste from the 4500 Area. Flow through MH-190 goes to these ponds and each requires about 10 hrs to fill. When one pond is full, the flow is diverted to the other pond, and the proportional sample at MH-190 is taken. A 25-ml aliquot is sent to the Analytical Laboratory, Building 2026, for gross-beta and alpha analysis. If the sample analyzes less than five beta counts  $\text{min}^{-1}\text{ml}^{-1}$  and zero alpha counts  $\text{min}^{-1}\text{ml}^{-1}$ , drain the pond to White Oak Creek. If the analysis exceeds these limits, pump the pond to the Equalization Basin. The ponds may be bypassed (by authority of the supervisor) by closing a valve in the weir box at MH-190; waste will then be routed to the Diversion Box. The 4500 Area waste ponds are to be checked at least once per shift.

## 2.9. Monthly Composite Samples - Process Waste

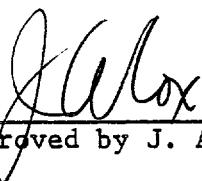
2.9.1. Flume Station, Settling Basin, White Oak Creek, and Melton Branch

These monthly composites are composed of 24-hr proportional samples taken from the various stations of the process waste system. They represent an inventory of the activity discharged to the environs. Table 2.3 is a list of the sampling points, all samples taken, and the analyses desired. Each composite sample is kept at pH of 1 or less during the month by the addition of 8N HNO<sub>3</sub> as required to prevent the settling out of activity on the bottom of the drum as follows:

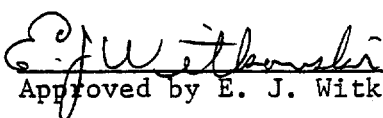
1. Check pH of solution in drum using pHyrion paper and add 8N HNO<sub>3</sub> to keep pH 1 or less.
2. If a precipitate is still present in drum, add HNO<sub>3</sub> and agitate to dissolve precipitate. Notify supervision if precipitate does not dissolve.

The sample for the monthly composites is taken on the last day of the month as follows:

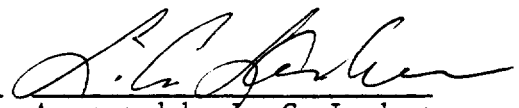
1. Thoroughly agitate the solution in the drum using an electric agitator.
2. Take a full 1-gal bottle for analysis.
3. Take an additional 1-gal bottle for resample purposes. Leave the resample at the waste treatment plant.
4. Place each 1-gal sample in a plastic bag, seal the bag with tape, have sample surveyed by Health Physics and tag with a Health Physics transfer tag.
5. Discard remaining composite sample in drum to drain.



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TABLE 2.3. WASTE DISPOSAL SAMPLE SCHEDULE  
Liquid Wastes, Monthly Inventory Samples

Sample Point	Sample Number	Sample Method	Analysis	Delivery
Settling Basin (Discharges to White Oak Creek)	MC-1	3 liters of the total monthly proportional collection	1. Gross beta 2. Gross alpha 3. Total strontium by chemical separation	Low-Level Laboratory, Y-12
Flume Station	MC-3	Same as above	Same as above	Same as above
White Oak Creek (Discharge to White Oak Lake)	MC-6	Same as above	Same as above	Same as above
Melton Branch	MC-7	Same as above	Same as above	Same as above
Manhole Monitors	MH-25, etc.	A 10-ml aliquot of the monthly composite	1. Gross beta 2. Gross alpha	Analytical Control Laboratory, Building 2026
Evaporator CP Exchange Column	A5A	Total monthly composite (continuous drip sample)	Same as above	Same as above
WTP Influent	MC-2	3 liters of the monthly composite (continuous drip sample)	Same as above	Same as above

  
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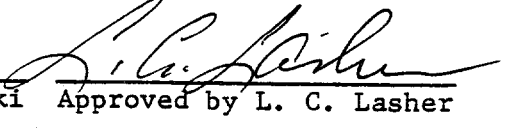

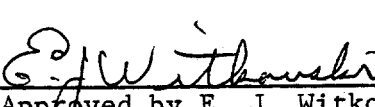
  
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TABLE 2.3. (Continued)

## Liquid Wastes, Control Samples

Sample Point	Frequency	Sampling Method	Analysis	Delivery
Diversion Box	Daily, at 8-hr intervals	A 10-ml aliquot of the proportional collection	1. Gross beta once per day at 10:00 a.m. 2. Gross alpha every 8 hrs	Analytical Control Laboratory, Building 2026
White Oak Creek (Discharge to White Oak Lake)	Once per day	A 10-ml aliquot of the proportional collection	Gross alpha	Analytical Control Laboratory, Building 2026
Hold-up Ponds 1. 4500 2. HFIR 3. TRU	Sampled when pond is full	A 10-ml aliquot of the proportional collection	1. Gross beta 2. Gross alpha	Analytical Control Laboratory, Building 2026

  
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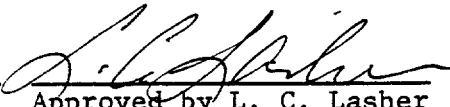


  
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TABLE 2.3. (Continued)  
Gaseous Effluent Samples

Sample Point	Frequency	Sample Method	Analysis	Delivery
3039 Stack	Monday, Wednesday, and Friday 8:00 a.m.	1. Duplicate charcoal and paper filter assemblies 2. One sample stream equipped with additional charcoal filters down stream. This filter contains about 300 cc of charcoal.	1. Charcoal: gamma scan significant activity; i.e., anything 10 <sup>3</sup> dpm 2. Paper a. Gamma scan as above b. Gross beta c. Gross alpha - this sample is held for 4 days then recounted.	Analytical Laboratory, Building 3019
HFIR	Once/Week Monday at 8:00 a.m.	Single charcoal - filter assembly	Same as above	Same as above
MSRE	Once/Week Monday at 8:00 a.m.	Same as above	Same as above	Same as above
3020	Once/Week Monday at 8:00 a.m.	Same as above	Same as above	Same as above
2026	Once/Week Monday at 8:00 a.m.	Same as above	Same as above	Same as above

  
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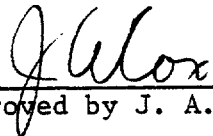
  
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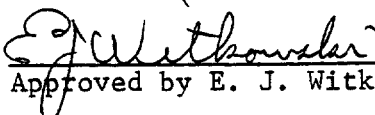
6. Thoroughly clean the drum for collecting next month's composite sample.
7. Deliver all samples to the Low-Level Laboratory in Building 3019.

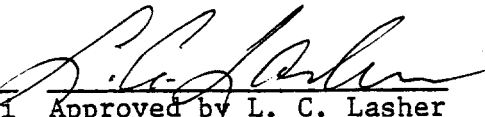
#### 2.9.2. Manholes and Influent Process Waste Treatment Plant

These monthly composites are composed of a proportional sample taken from the 24-hr proportional samples obtained at each manhole and the influent at the process waste treatment plant. Table 2.3 is a list of the sampling points, all samples taken, and the analyses desired. The pH of each composite sample is kept at 1 or less during the month by the addition of 8N HNO<sub>3</sub> as required to prevent the settling out of activity on the bottom of the sample bottle. The sample for the monthly composite is taken on the last day of the month as follows:

1. Agitate the solution in the bottle thoroughly.
2. Take a 2-liter sample for analysis.
3. Discard remaining portion of sample.
4. Place sample in a plastic bag, seal the bag with tape, have sample surveyed by Health Physics, and tag with Health Physics transfer tag.
5. Provide clean bottle or thoroughly clean the empty bottle for collecting next month's composite sample.
6. Add 50 ml of 16N HNO<sub>3</sub> to the empty sample bottle.
7. Deliver all samples to the Low-Level Laboratory in Building 3019.

  
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## 3. GASEOUS WASTE SYSTEM

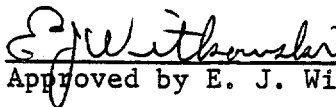
Gaseous wastes from the operations in Bethel Valley are discharged from four stacks which are monitored. The central cell ventilation and off-gas systems, serving most of the area, terminate at the 3039 stack. Ventilation air from the Pilot Plant, Building 3019, is released at the 3020 stack; cooling air from the OGR passes out through the 3018 stack; and ventilation air from HRLAL, Building 2026, is discharged through a small stack at that location. In Melton Valley one stack serves the duct system connected to the HFIR building, TRU, TURF, and a separate stack operates at the MSRE. All of these stacks have a collection sampler and most have continuous activity and flow monitors. All monitors read out in 3105 and are clearly labeled as to the area they serve.

The cell ventilation system, sometimes called the "high volume-low level" system, is composed of air from processing equipment cells and laboratory analytical hoods. Negative pressure for the central Laboratory system (3039 stack area) is produced by three electrically-driven fans (two steam-driven auxiliary fans) capable of moving approximately 195,000 cfm. All major cell ventilation ducts in both the central Laboratory system and in the HFIR system are monitored by tape monitors and are provided with flow-measuring devices. All of these instruments transmit signals to Building 3105 where they are recorded. Important ducts in the 3039 stack area also have sampling ports where collection samplers employing filter-charcoal cartridges may be attached.

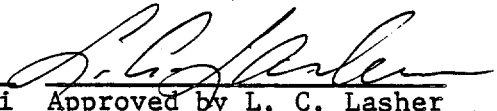
Off-gas is a stream of gaseous waste of much smaller volume than cell ventilation but containing much more activity. Off-gas lines are connected directly to operating equipment for venting purposes or where reduced



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pressure is required. In addition to radioactive emission, this system must also dispose of organic vapors and acid and caustic fumes. A central system, terminating at the 3039 stack, serves the Bethel Valley area of the Laboratory. The treatment facility includes a caustic scrubber for the removal of reactive gases (Figures 3.1 and 3.2) and a high efficiency filter unit to remove particulate material. An electric blower with steam auxiliary provides a capacity of 4,000 cfm.

Particulate activity discharge from the off-gas system is monitored by a tape monitor; mechanical reliability--flow, vacuum, pressure drop, etc.--is monitored by a group of recorders, indicators, and ON/OFF lights.

### 3.1. Radiation Monitoring and Sampling

As noted in the foregoing, a variety of instruments monitor the safe operation and mechanical dependability of the Laboratory's gaseous waste disposal operation. Most of these instruments telemeter information to Building 3105. It is the responsibility of the operator on duty in this building to transcribe certain data onto prescribed forms, to watch for unusual or abnormal indications, and to take appropriate action when such indications are noted.

#### 3.1.1. General

1. Operate all count-rate meters at a minimum range so that the normal trace is 20% of scale. Decontaminate detector shields as necessary. Replace charcoal bottles in the iodine monitors as needed to maintain the correct range.
2. Advance all tapes once per shift at the beginning of the shift. If a tape should break at this time, investigate and repair as soon as possible.

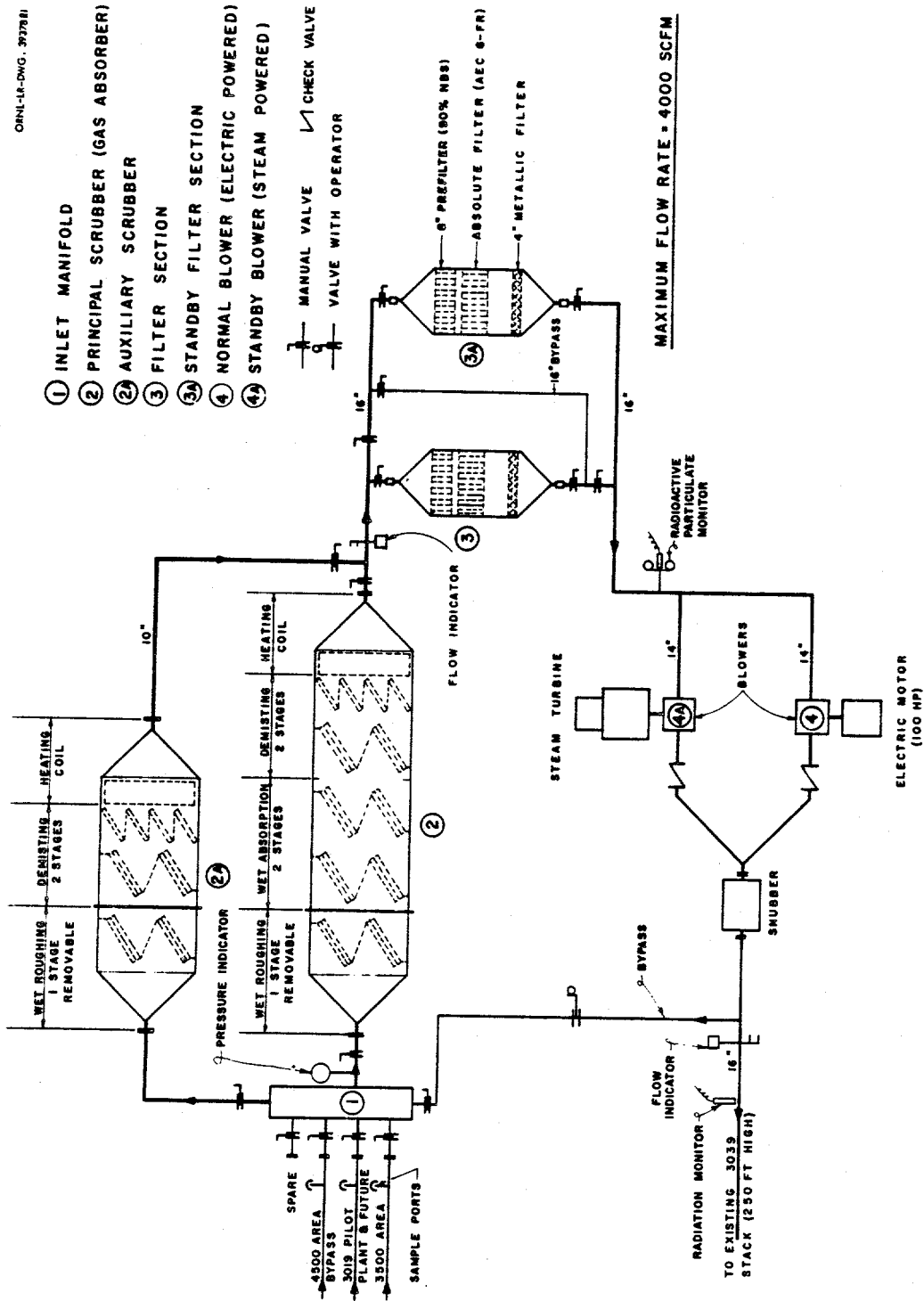


Fig. 3.1. Schematic of Air Flow through the Off-Gas Treatment Facility

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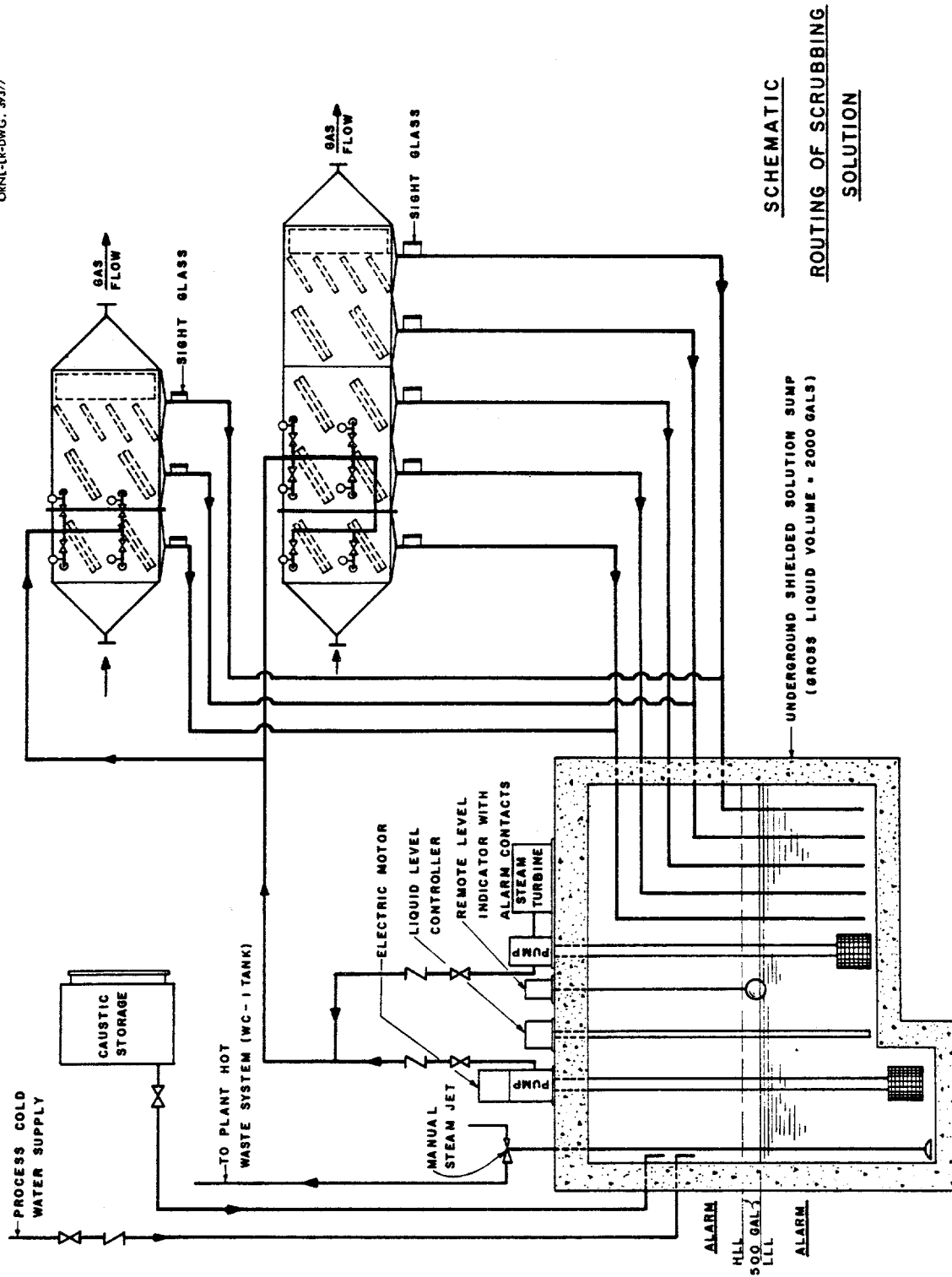


Fig. 3.2. Routing of Scrub Solution through the Off-Gas Treatment Facility

3. Maintain a minimum readout by advancing the range of the count-rate meter as required. When the maximum range is reached on the CRM, advance the tape. Note all tape advances and range changes in the log book and on the recorder chart.
4. Record, on an hourly basis, all activity readings indicated on forms UCN-6252 and 6252A, "Gaseous Waste Monitoring - Stacks" and "Gaseous Waste Monitoring - Facilities". Any readings not to be taken will be indicated on the form by the supervisor.
5. See that all equipment failures are promptly repaired. If this cannot be done by shift personnel, call:

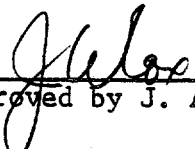
John Blanton, Oak Ridge, 483-1049, or

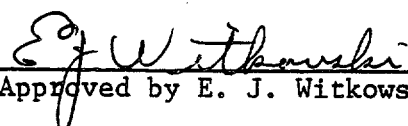
Clyde Moree, Fountain City, 689-5414

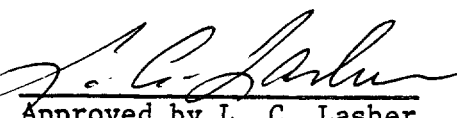
#### 3.1.2. Unusual Occurrences

Cell Ventilation Duct Particulate Monitors - Any accumulation of activity in excess of 20% above normal background over a 15-min interval should be investigated. Proceed as follows:

1. Contact the source areas by phone (see Table 2.1). Inform them of the degree of contamination and request their cooperation. Obtain as much information as possible and record in the log book.
2. If the accumulation continues over a 30-min period, sample the tape and deliver it to Building 3503 for identification. Notify your supervisor.
3. Notify your supervisor whenever a monitor exceeds the 10 K scale.

  
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4. Record all activity peaks. Note the following in the log book:

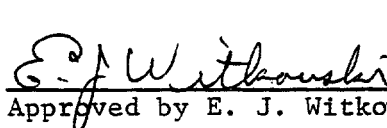
- a. Time of occurrence
- b. Magnitude - For example: 50% of 25 K scale
- c. Duration
- d. Source
- e. Cause, if possible
- f. Flow

Off-Gas Particulate Monitor - Any accumulation of activity in excess of 20% of scale over a 15-min interval should be investigated. Proceed as follows:

1. Check filter pressure drop.
2. Check the scrubber for proper operation.
3. Sample the tape and deliver to Building 3019 for gamma scan.
4. Check the ORR pressurizable off-gas monitor and the 3039 stack iodine monitor. If these do not indicate trouble, contact the area supervisors in Buildings 4507, 3517, and 3019.

Stack Beta-Gamma Particulate Monitors - Select count-rate meter ranges to give readouts of about 20% of scale. Any increase in excess of 20% above background in 15 min should be investigated. If the activity rise occurs at the 3020, 2026, or MSRE stacks, call the responsible areas as listed in Table 2.1. If the HFIR stack is involved, look for similar indications of activity on the HFIR, TRU, and TURF monitors. If the apparent release is at the 3039 stack, check the four cell ventilation monitors and the central OG monitor. If the activity release cannot be traced via a duct to a particular facility, remove a portion of the stack monitor tape and the cartridge from the in-stack sampler and deliver to

  
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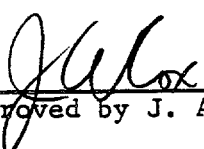

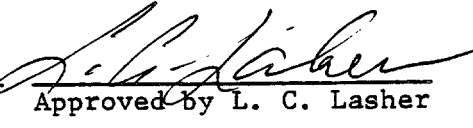
the analytical laboratory for analysis. Notify your supervisor if the upset has not cleared within 30 min.

Stack Alpha Particulate Monitors - Select count-rate meter ranges to give readouts of about 20% of scale. Any increase in excess of 30% above background in 15 min should be investigated. If the activity rise occurs at the 3020, 2026, or MSRE stacks, call the responsible areas as listed in Table 2.1. If the condition does not normalize in 15 min, remove a portion of the stack monitor tape and deliver to the analytical laboratory for analysis. In this event, notify your supervisor. This action is to be taken at any stack showing an alpha release which does not subside.

Stack Iodine Monitors - Operate the count-rate meters on the 250 cpm range. Charcoal in detection chamber should be changed as required to conform. This can be accomplished remotely from 3105. If an increase in excess of 80% above background in 15 min is seen, notify the appropriate persons listed in Table 2.1.

Health Physics Local Air Monitor (LAM) - Any increase in activity on this system is significant. Proceed as follows:

1. Contact H. H. Abee or Shift HP, Phone 3-6989, for verification; that is, to determine whether or not the instrumentation is functioning properly.
2. Notify the area responsible (as indicated by other instrumentation). Inform them that airborne contamination has been detected in the plant area and request that they terminate operations.
3. If the 3039 monitoring system is not indicating an alarm condition, pull the 24-hr samples from the 3020, 2026, MSRE, and HFIR stacks. Deliver to Building 3019 for analysis.
4. Notify your supervisor.

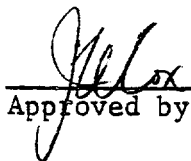
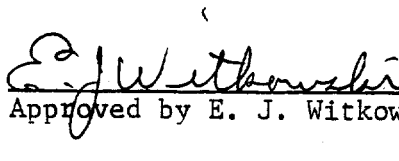
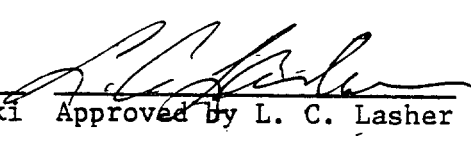
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Flow Recorders - Flow in each stack and duct (except 2026) is measured and recorded in Building 3105. The recorders are set to alarm if a particular flow drops significantly. If this happens in the 3039 stack system, the operator should first check the blower running lights for ON/OFF condition. If a blower is down, it should be restarted. If the difficulty persists and is known to be real (that is, not instrument trouble), supervision should be notified. If a flow drop occurs in another area (MSRE, HFIR, or 3020), supervision in that area should be informed (see Table 2.1).

Stack and Duct Sampling Procedures - All stack sampling stations are equipped with a collection cartridge containing charcoal and a filter paper. All stacks with the exception of 3018 employ an in-stack sampler with a "slide-in" cartridge holder. Stations are identified as follows:

- 1 - HFIR Stack (50-ft level)
- 2 - MSRE Stack (50-ft level)
- 3 - Bldg. 2026 (HRLAL)
- 6A - 3039 Stack
- 6B - 3039 Stack (Duplicate)
- 8 - 3020 Stack (50-ft level)

Stack samples Nos. 6A and 6B are changed Monday, Wednesday, and Friday; Nos. 1, 2, 3, and 8 weekly on Monday. Special duct samples may be taken either to pinpoint the source of a release or to monitor the gaseous releases from a specific operation. Two nylon cartridge holders are available which will accommodate the charcoal-filter cartridge routinely used in the in-stack samplers. These may be attached at existing openings in various ducts and samples taken by means of portable pump-rotameter

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assemblies. Your supervisor will advise when this operation is necessary and will specify the point at which sampling is to be carried out.

Procedure for Handling Samples -

1. Place each sample in a plastic bag and have it surveyed and tagged for transfer by Health Physics.
2. Deliver the samples as soon as possible after they are taken to the analytical storage area in Building 3019.
3. Notify supervision if any sample is surveyed greater than 20 mr/hr as the analytical lab will not accept samples above this level.

## 3.2. Cell Ventilation System

3.2.1. Procedures in the Event of a Power Failure

## 1. 3039 Stack Area

a. A loss of power or an increase in duct pressure will actuate the control systems and automatically start the North, the 3500 area, and the ORR cell ventilation turbine-driven blowers.

b. A loss of power or loss of air flow will actuate the control systems and automatically close dampers on the following cell ventilation systems:

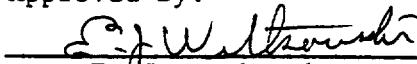
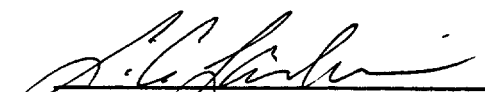
- (1) 3025, 3026 electric blower; inlet damper.
- (2) Isotope Area electric blower; inlet damper.
- (3) 4500 area electric blower, discharge damper.
- (4) 3500 area electric blower, discharge damper.

In each case the flow is monitored by a "sail" or flapper device which has been installed within the duct, downstream of the blower. Backdraft preventers at each of these blowers also close with the dampers.

c. The following alarm signals will be actuated simultaneously with a power or equipment failure:

- (1) The stack air horn will blow.
- (2) The red pilot lights on the local panelboard will go on.
- (3) The audible alarm in Building 3105 will sound.
- (4) The appropriate pilot lights in Building 3105 will go on.

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L. C. Lasher

d. In the event of a power failure, all roving operators will report to the stack area as rapidly as possible. The 3105 operator will report to the stack area immediately and remain until the area is operating normally or the roving operators arrive. The following steps should be performed:

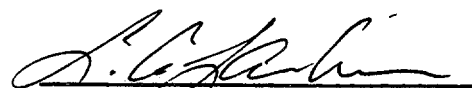
- (1) Silence the air horn by turning "OFF" the appropriate toggle switch at the local panelboard.
- (2) Check the turbines for proper operation.
  - (a) Close the blowdown valves.
  - (b) Check the lubricating system pressures.
  - (c) Check the cooling water system for proper flow.
  - (d) Check bearing temperatures.
  - (e) Check position of backdraft preventers.
- (3) Check the dampers and backdraft preventers to the electric-driven blowers. Close the manual dampers if the automatic system has failed.
- (4) As soon as operating conditions permit, the 3105 operator will return to the control building and
  - (a) Resume normal control operations.
  - (b) Complete form "3039 Stack Area - Check List, Procedure in Event of Power Failure".

2. 3020 Stack

- a. Normally this area is the responsibility of the pilot plant operators. However, if the area is on "patrol", the patrol operator who is responsible will report to

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the area as soon as possible. The turbine and damper positions should be checked according to procedure.

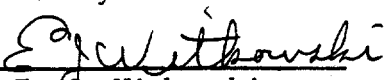
(See Building 3019 Emergency Manual, Section 5.5.)

3.2.2. Procedures after Resumption of Normal Power

1. 3039 Stack

- a. Start the North electric blowers. Open the automatic dampers by pushing the RESET buttons which are located on the starter boxes.
- b. Shut down the North turbine by pushing the RESET button (HSS-61) located at the alarm panel. This closes steam valve PCV-61. Close steam valve PCV-63 by manually latching the control lever on PSV-63 in the UP position.  
Open the turbine blowdown valves.
- c. Start the 3500 area electric blower. Open the discharge damper by turning valve HV-22 from AUTO to MANUAL.
- d. Shut down the 3500 area turbine by pushing the RESET button (HSS-21) on the local control panelboard. This closes steam valve PCV-21. Close steam valve PCV-23 by manually latching the control lever on PSV-23 in the UP position. Open the turbine blowdown valves. Return valve HV-22 to the AUTO position.
- e. Start the ORR CV blower and open the discharge damper by pushing the RESET button (ES-110). Return the steam turbine to standby operation by:
  - (1) Latching the control lever on PSV-110 in the UP position.

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L. C. Lasher

- (2) Stopping the bleed of air from the pressure regulator in the air line to PV-108 until the pressure indicated on the gage is greater than 60 psi. Observe that the bleed has stopped.

Verify that the backdraft damper in the turbine discharge is closed. (If it is not completely closed, the turbine blower shaft will rotate in the reverse direction.)

- f. Return all switches on the alarm panel to the NORMAL position.
- g. Complete form UCN-6959, "3039 Stack Area Check List Procedure After Resumption of Normal Power".


2. 3020 Stack


At the 3020 stack, the return to normal power operation is accomplished by pushing three buttons either on the containment panel or on the control panel outside the fence on the northwest corner of Building 3019. Start the electric fans by pushing PB-2 and 4, CELL FAN START and LAB FAN START; and, after 10 sec, PB-1 FAN SYSTEM RESET.

3.2.3. Test Procedures for the Emergency Blowers

1. All of the steam turbines with the exception of that serving the ORR will be tested at least once per week by means of a simulated failure. The ORR equipment will be tested as a part of the end-of-cycle functional check. Prior to testing, the steam plant foreman should be notified. Your supervisor will schedule the emergency equipment tests. Complete form UCN-6962, "3039 Stack Area Check List Routine Weekly Test Procedure", at

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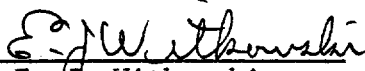
  
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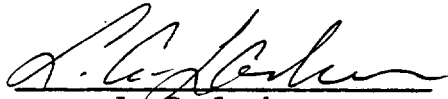
  
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the time of the test. A more complete test of stack area equipment will be made on a monthly basis. Complete form UCN-6961, "3039 Stack Area Check List Routine Monthly Test Procedure", at that time.

- a. North turbine - Bleed the pressure switches to atmosphere by venting three-way valves HV-61 D and HV-63 C located on the pressure transmission lines. (Turn to TEST position.) The turbine will start automatically. Allow the equipment to operate for 10 minutes with HV-61 D vented and 10 minutes with HV-63 C vented. Check frequently for proper operation. Shut the turbine down by closing the vent valves and pushing the RESET button (HSS-61). After closing HV-63 C the control lever on PSV-63 must be manually relatched.
- b. 3500 area cell ventilation system - Turn damper control valve HV-22 from AUTO to MANUAL. Bleed the system air pressure by venting three-way valves HV-21 D and HV-23 C located in the pressure transmission lines. (Turn to TEST.) The turbine will start automatically. Allow the equipment to operate for 10 minutes with HV-23 C vented and 10 minutes with HV-21 D vented. Check frequently for proper operation. Shut the turbine down by closing the vent valves and pushing RESET button HSS-21. After venting with HV-23 C, the control lever on PSV-23 must be manually relatched. Return the damper control valve HV-22 to AUTO.
- c. Testing of ORR CV equipment -
  - (1) With the electric-driven blower operating and the steam-driven unit on standby, turn the electric blower

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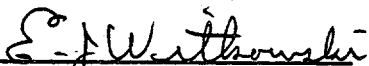
  
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OFF. The backdraft damper for the steam blower should OPEN automatically, along with the automatic startup of the turbine.

- (2) Verify that both automatic steam-control valves, PV-108 and PV-110, are OPEN. See that the steam turbine is operating properly and that the dampers above the electric blower are CLOSED.
- (3) Restart the electric blower and reset the dampers.
- (4) Return the steam turbine to standby operation by:
  - (a) Raising the reset lever controlling PV-110 to the UP position.
  - (b) Stopping the bleed of air from the pressure regulator in the air line to PV-108 until the pressure indicated on the gage is greater than 60 psi. Observe that the bleed has stopped.
- (5) Verify that the turbine damper is CLOSED. (If it is not completely closed, the turbine shaft will rotate in the reverse direction.)
- (6) Check the low-steam pressure alarm by closing the overhead chain valve in the steam supply line. Observe steam pressure indicator, PI-118. When the pressure reaches approximately 75 psi, an alarm should occur in the ORR control room. Verify this.
- (7) Complete form UCN-6963, "End-of-Cycle Check of ORR Cell Ventilation and Pressurizable Off-Gas Systems". Note any malfunctions and/or abnormal conditions in the Shift Log Book.

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### 3.3. Off-Gas System

#### 3.3.1. Off-Gas Control System

Recorders, indicators, and ON/OFF lights monitoring the mechanical reliability of the central off-gas system are located in Building 3105. These include a flow recorder (0 to 4000 cfm), a header vacuum recorder (0 to -100 in. H<sub>2</sub>O), and a sump level indicator (0 to 100%). Red lights indicate a high filter pressure drop, a high or low caustic sump level, low discharge flow or header vacuum, and power loss to the blower or sump pump. In the event of an annunciation caused by a red condition of any of these monitors, the operator will attempt to make the necessary corrections following the outline given in Table 3.1. If the difficulty persists, notify supervision. On occasion, the central off-gas system will be shut down and the auxiliary system will be placed in operation. The position of the key switch on the monitoring panel should then be changed to activate the ON/OFF lights on the auxiliary system. Normal operation of the electric heater, the electrostatic precipitator, and the auxiliary blower will then be indicated. In the event of a failure of any of these components, an attempt should be made to restart them by following the procedure outlined in Section 3.3.4. If unsuccessful, notify supervision.

#### 3.3.2. Caustic Scrubber

##### Initial Start

1. Inspect all equipment for condition and lubrication.
2. Valve in the caustic supply and drain lines to the gas absorber desired. Check the sump for the proper caustic level.

Table 3.1. Abnormal Conditions in Caustic Scrubber

Condition	Cause	Remedy
High manifold vacuum (in excess of 60 in. of water)	Insufficient air flow due to shutdown of one or more facilities  Improper operation of bleed valve	Normally corrected automatically by bleed valve. Check for normal operation; adjust set point lower only if necessary.  Lower set point; if necessary, remove air line to valve.
Low manifold vacuum (less than 40 in. of water)	Failure of operating equipment  Excess air flow from one or more facilities  Improper operation of bleed valve  Partial plugging of one or more sections of scrubber or filter  Ducting valve partially closed	Normally corrected automatically by switch to steam equipment (audible alarm at switch over)  Normally corrected automatically by bleed valve. Check bleed valve operation; adjust set point higher only if necessary.  Raise set point; if necessary, block air inlet with tape as required.  Switch to standby filter or auxiliary scrubber as conditions indicate  Open valve
Fluctuating vacuum	Bleed valve cycling	Increase setting of proportional band until cycling stops
High caustic pressure	Partial plugging of spray nozzles	Switch to auxiliary scrubber

Table 3.1. (Continued)

Condition	Cause	Remedy
Low caustic pressure, electric pump only operating	Plugged strainer	Switch strainers
Low caustic pressure, both pumps operating, audible alarm	Low caustic level in sump- automatic valve is inoperative	Use manual bypass around automatic fill valve.
Operation of one or both steam units	Failure of electrical unit for any reason	Correct as necessary.
Flooding of scrubber	High vacuum	Stop caustic pump, reduce vacuum immediately, restart pump
	Plugged drain lines	Stop caustic pump, switch to auxiliary scrubber, restart pump.
Low caustic level in sump, audible alarm	Inoperative automatic fill	Bypass automatic valve with manual fill
High caustic level in sump, audible alarm	Inoperative automatic fill	Close manual valve; jet sump as required
	Inaccurate manometer	Check level visually

Table 3.1. (Continued)

Condition	Cause	Remedy
Low vacuum at one or more facilities	Low vacuum at manifold	See "Low manifold vacuum"
	Partial plugging of off-gas lines	Check all valves; start at manifold
	Downstream facility admitting excess amount of off-gas	Correct at source
Audible alarm	Insufficient air flow	See "High manifold vacuum"
	Low caustic level	See "Low caustic level"
Audible alarm	High caustic level	See "High caustic level"
	Insufficient vacuum (automatic switch to steam blower)	See "Low manifold vacuum"
	Low caustic pressure	See "Low caustic pressure"

3. Start the primary (electric) caustic pump.
4. Check for proper flow of caustic. Adjust the pressure to the spray nozzles to the desired level (5 psig).
5. Valve in the off-gas ducting to the proper gas absorber and to the desired filter.
6. Open the off-gas supply lines to the suction manifold.
7. Start the primary (electric) blower.

NOTE: The system will attempt to switch to the standby (steam) blower unless the DELAY button, located just above the start and stop buttons on the motor controller, is pushed. The DELAY button must be held in IN position until the system comes to operating vacuum.

8. Check the entire system for operating conditions. Manifold vacuum must not exceed 60 in. of water. Negative pressure in excess of this will cause the gas absorber to flood with caustic.
9. Open the manual valves in the steam supply to both standby turbines. The automatic valves will remain closed, preventing operation except in the case of a primary unit failure.
10. Follow steps 1-9 for "initial start-standby units" except that the standby units must be brought on manually at the times indicated.

Switch from main gas absorber to auxiliary gas absorber

1. Valve in the caustic supply and drain lines to the auxiliary gas absorber. Check for proper flow. Adjust the pressure to the nozzles.

2. Line up the off-gas ducting to the auxiliary, placing the main and auxiliary units in parallel operation.
3. Close the valves in the off-gas ducting to the main unit.
4. Close the valves in the caustic supply to the main unit.
5. After all caustic has drained from the main unit, close the valves in the caustic drain line.


To switch absolute filters

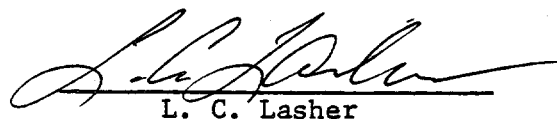
1. Line up the off-gas ducting to the alternate filter, placing the filters in parallel operation.
2. Close the valves in the ducting to the original filter.
3. Do not allow both filters to be bypassed at any time.

3.3.3. Test Procedure for the Emergency Off-Gas Equipment

1. To insure the reliability of the emergency equipment, both the turbine-driven blower and the caustic-circulating pump will be tested on a weekly and monthly basis at the same time that the cell ventilation equipment is tested. As noted in Section 3.2.3., forms UCN-6962 and 6961 will be completed at those times.
2. Procedures:
  - a. Notify the Steam Plant, ORR shift engineer, and the shift foreman in Building 3517.
  - b. Start the blower turbine:
    - (1) Start the emergency equipment by opening three-way valves HV-43 C and HV-41 D in the pressure transmission lines. (Turn to TEST. Both the electric and turbine blowers will be operating in parallel.

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L. C. Lasher

The turbine should attain approximately 50% normal rpm as a result of the "drag" from the electric blower.) Allow the turbine to operate 15 minutes.

- (2) Check oil pressures, bearing temperatures, etc.
- (3) Stop the turbine by returning HV-43C and HV-41D to NORMAL and pushing RESET button HSS-41. Manually relatch the control lever on PSV-43.

c. Start the turbine-operated caustic pump. Since a failure of both caustic pumps would not result in a loss of off-gas service, these pumps can be started by simply de-energizing the electric pump motor. Restart the electric pump after testing.


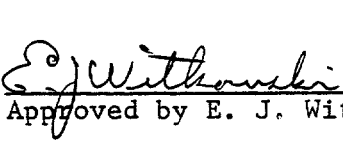
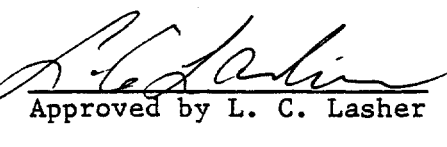
#### 3.3.4. Standby Operation of the Auxiliary Off-Gas System

3.3.4.1. Setting of Automatic Controls - For automatic startup in the event of a failure of the central off-gas system, set vent valves HV-1D, HV-3A, HV-3B, and HV-1E in the NORMAL position and set the control pointer in PIC-1 on 35 in.

The steam blower will now start automatically whenever the indicated pressure falls below 35 in. The electric blower may be started at any time by pushing its START button without affecting the status of the automatic controls. The Cottrell precipitator is not controlled automatically and must be started as noted below.

3.3.4.2. Starting of Electric Blower - To start the electric blower after the steam blower has been energized:

- a. Start the electric blower; the discharge valve will remain closed and the turbine will continue to operate.

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b. Change the system selector from position No. 3 to No. 1. The turbine will shut down if the indicated pressure is below 35 in.

c. Reset the system selector rapidly from position No. 1 to No. 3.

The turbine is now in standby status and will start if the indicated pressure drops below the set point.

#### 3.3.4.3. The Cottrell Electrostatic Precipitator

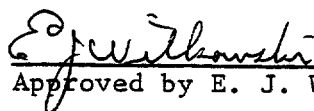
Equipment Description - The Cottrell Electrostatic Precipitator consists primarily of an inlet chamber at the bottom, an outlet chamber at the top, and the electrode system connecting the two. The overall height of the unit is twenty-two feet and the diameter at the base is six feet.

The electrode-collecting system consists of twenty-three 8-in. ID 316 SCb stainless steel pipes connecting the upper and lower chambers. These pipes have an overall length of 12 ft. The air to be cleaned enters the lower chamber through a duct on the west side, passes upward through the collecting electrode pipes, and leaves the upper chamber through a duct on the north side.

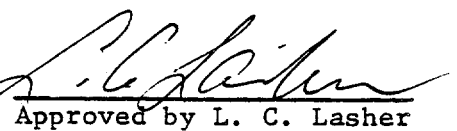
The discharge electrodes, constructed of 14 gauge (BWG) SCb stainless steel wires, are suspended by an insulated bussbeam in the upper chamber of the unit and attached to a steadying frame in the lower chamber of the precipitator. To the lower end of each discharge electrode is attached a porcelain weight to keep the discharge wires straight. The discharge electrodes, which are centered in the pipes for their entire lengths, are charged negatively and the collecting pipes are grounded. All particles, down to 0.1 micron diameter, in the entering air stream receive a negative charge and deposit inside the collecting electrode pipes. These particles are removed from the pipes by periodic flushdowns and are transferred to the ILW system.



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Rated input of the unit is 460 volts, 100 amps, 60 cycle, 3 phase.  
Rated output is 0.5 amps DC at 75,000 volts.

An outlet air heater assembly, located in the airstream on the discharge side of the upper chamber, prevents condensation of water vapor in the adjacent filter box.

The insulators which support the high tension discharge electrode system are located in compartments which are attached to the east and west sides of the upper chamber of the precipitator. To prevent accumulation of moisture on the support insulators, steam coils are installed in each insulator compartment to heat the compartments above the gases in the precipitator. Steam to these heaters should be left on at all times. Slide valves on the inlet and outlet airstream ducts allow the unit to be bypassed when repairs require the shutting down of the precipitator.

#### Power Supply Operation -

##### Entering High Voltage Section

1. Close the control power safety switch (S201).  
(White pilot ground light at the door is now on.)
2. Turn on the cubicle lights.
3. Unlock the key switch. Use the same key and unlock the key (bolt) lock. Enter the high voltage section.
4. Place the grounded hook stick on the high voltage conductor.
5. Open the disconnect switch with the grounded hook stick and leave the stick on the switch.

##### Leaving High Voltage Section and Energizing Equipment

1. Close the disconnect switch and remove the hook stick from the high voltage conductor. Hang both hook sticks on the transformer hangers as provided.

2. Close the door. Close the key (bolt) lock and use the same key to close the key switch. (Fence gate interlocks must be closed likewise.)
3. Close the main disconnect switch (S101).
4. Close the blower combination starter safety switch (S601).
5. Close the filament circuit safety switch (S301).
6. Close the blower control switch (S603). (Green light - 1203 - is now on.)
7. Close the control power control switch (S204). (Green light - 1203 - is now off, red light - 1202 - is now on, ground light - 1201 - is now off and the key cannot be removed from the interlocks either at the door or at the fence gate. After a 30-sec time lapse, green light - 1401 - is on.)
8. Select either automatic or manual reclosing, whichever is desired (S403).
9. Close the main high voltage "on-off" control switch (S402) and allow the switch to return to normal. (Green light - 1401 - is off, red light - 1402 - is now on.)
10. "Raise or lower" DC output with control switch (S401).

#### De-energizing Equipment

Reverse the procedure as outlined above.

**IMPORTANT:** Before de-energizing this equipment, manually de-energize the alarm control circuit at the alarm control panel.

#### To Determine Primary Voltage

Turn the selector switch (S602) to the circuit desired and read the primary voltmeter (M601).

To Determine DC Output

The DC output current and voltage is read directly on meters M501 and M502, respectively. The number of times the rectifier is turned on is recorded by timer M402.

To Bypass the Cottrell Precipitator -

1. Shut down the precipitator as follows:
  - a. Trip the high voltage.
  - b. Trip the control power switch.
  - c. Turn to Off Blower Switch.
  - d. Turn to Off S 301 Switch.
  - e. Turn to Off S 601 Switch.
  - f. Turn to Off S 101 Switch.
  - g. Turn to Off S 201 Switch.
2. Unlock the gate to the fenced-in area around the precipitator and make a radiation survey to determine the working time allowable for operating the valves.
3. Open the precipitator bypass valve in the line running east from the main off-gas line.
4. Close the inlet valve to the precipitator located between the hot off-gas manifold and the precipitator.
5. Close the outlet valve from the precipitator located near the top on the north side.
6. Lock the fence gate.

Cleaning Procedure - To remove the collected particles from the collecting electrode pipes, two flushing systems are built into the unit. One, a continuous flushing system, is not used since the precipitator is used

only as an auxiliary system. The other, a washdown system, is operated as follows:

1. Check that there is approximately 500 gallons of free space in tank WC-1.
2. Raise the voltage until the unit shorts out sounding the alarm bell. This will check the alarm system.
3. Close the high voltage switch and put the unit back in operation by lowering the voltage until the unit stays in operation.
4. Trip the high voltage switch (S402).
5. Open underground water supply valve to the unit.
6. Close the wash tank drain valve.
7. Open the pump seal drain valve.
8. Check that the rotameter valves are closed. These valves should remain closed at all times.
9. Check that the continuous flush line valves are closed at all times.
10. Check that the valve on the pump recirculating line is closed. This valve should remain closed at all times.
11. Check that the vent valve on the discharge line from the pump is closed. This valve should remain closed at all times.
12. Check that both valves in the discharge line of the pump are open. These valves should remain open at all times.
13. Open the manual control water valve to the wash tank. When the float control arm drops to the point which indicates the wash tank is full, close the manual control water valve to the wash tank.

14. Turn on the pump. If the gauge on the discharge line of the pump registers no pressure, the pump is not pumping. If this be the case, stop the pump and then quickly start it again. If this procedure fails, priming the pump will be necessary. If this be the case, proceed with steps 15 through 21. If the pump does not have to be primed, let it continue to run for ten minutes and then proceed directly to step 22.
15. Close the valve on the wash down line inside the rotameter case.
16. Turn on the underground water supply valve to the continuous flush system.
17. Turn on the above ground valve on the continuous flush water line.
18. Open the valve on the continuous flush water line below the rotameter case allowing water to run back through the shutdown pump thus priming the pump.
19. As soon as the pump is primed, cut off the valve from continuous wash line under the rotameter case.
20. Turn on the pump and note the pressure on the gauge.
21. Open the valve in the rotameter case on the wash line and wash for ten minutes.
22. Shut off the pump.
23. If it was necessary to prime the pump, do steps 24 through 26; if not, proceed to step 27.
24. Close the underground valves to the continuous flush water supply and open the drain.

25. Open the above ground valve on the continuous flush water line.
26. Open the valve in the flush line supply under the rotameter case and allow the line to drain below the ground.
27. Open the wash tank drain valve.
28. Open the pump seal drain valve.
29. When drainage is complete, close the valve under the rotameter case on the continuous flush water supply line.
30. Close the underground water supply valve to the unit and open the small drain valve.
31. Unlock the gate in the protective fence. This will automatically cut off the power from the high voltage section.
32. Enter the fenced area and check the blowdowns on each of the lines to the insulator heaters and on the line to the exit air heater.
33. Close the gate and lock it. The unit is now clean and in standby condition.

#### 3.3.5. Startup of the Auxiliary System

When it becomes necessary to shut down the central off-gas system, proceed as follows:

- a. Start the central off-gas turbine; shut down the electric blower.
- b. Start the auxiliary off-gas electric blower.
- c. Close the valve on the bypass system at the central off-gas manifold by setting the pneumatic controller to 10 in. Hg vacuum. (This is normally set at 7 in.)


At the same time, throttle the steam flow to the turbine to maintain normal pressure.

- d. Close the inlet valve to the scrubber. The central off-gas system is now isolated. Close the steam valve to the turbine as soon as possible.
- e. Shut down the scrubber circulating pump.
- f. Start the Cottrell precipitator.

#### 3.3.6. Procedures in the Event of a Power Failure

1. A loss of power or an increase in duct pressure will actuate the off-gas control system. The turbine blower will start automatically and continue to operate until it is manually shut down. Similarly, a loss of power or pressure will start the turbine driven caustic pump. At the same time, the stack air horn will blow and pilot lights will burn at the local control panel and the stack alarm panel. Corresponding alarms in Building 3105 will also be actuated.
  - a. The operator in Building 3105 will report to the area immediately; roving operators will report as soon as possible.
  - b. Silence the stack horn by pushing the reset button on the local alarm panel.
  - c. Check the turbine(s) for proper operation as per procedure.
2. The auxiliary OG turbine may come on with the central OG turbine and continue to operate even though the central system is operating normally. To shut down the auxiliary turbine, push RESET button HSS-1 and relatch the control lever on solenoid valve PSV-3.

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3. If the central system fails completely, the auxiliary system will be the operating system.
  - a. Isolate the central system immediately. Close the inlet valve to the scrubber.
  - b. Switch to the electric blower, if power is available, and put the turbine in standby.
  - c. Start the Cottrell precipitator if power is available. This system is equipped with an electric heater. The starter box for the heater is located on the east side of the precipitator. Operate the heater in the automatic position.
  - d. Complete the form UCN-6960, "3039 Stack Area-Check List Procedure in Event of Power Failure".

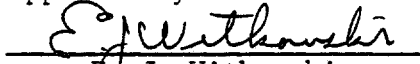
#### 3.3.7. Test Procedure for the Auxiliary Off-Gas System


1. Start the steam turbine by turning vent valves HV-1D and HV-3A to TEST. Allow the turbine to operate for 10 min with each valve vented separately. Verify that both steam valves PCV-1 and PCV-3 are OPEN.
2. Start the electric blower. Shut down the turbine by pushing RESET button HSS-1 and relatching the control lever on PSV-3. Check for proper operation of the electric blower and shut down.

#### 3.3.8. ORR Pressurizable Off-Gas System

In addition to the normal plant off-gas service, the ORR also has a separate system which is referred to as the Pressurizable Off-Gas System. The purpose of this system is to provide ventilation for specific experiments located at the reactor. The system consists of a single electric-

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powered blower, a filtration system and associated piping. A bypass to the auxiliary off-gas system makes it possible to utilize these blowers to ventilate the pressurizable system.

The ORR, by procedure, cannot operate without the pressurizable system in operation. If the reactor is down for a period exceeding 20 min, the fuel elements become poisoned and it is necessary to refuel the reactor prior to startup.


The operation of the pressurizable off-gas blower is monitored in Building 3105 by an indicator light and the system pressure is indicated on a gauge; both of these are connected to the annunciator panel. Equipment failure indicated by this alarm system must be checked immediately by the 3105 operator.

Loss or reduced pressure in the system will result in the auxiliary off-gas steam turbine automatically starting. To insure the reliability of this control system, a test will be carried out the end of each ORR operating cycle (when the reactor is down).

Proceed as follows:

1. Turn vent valves HV-1E and HV-3B to TEST; the auxiliary OG steam turbine will START. Allow to operate for 10 min with each valve vented separately.
2. STOP the turbine by turning vent valves HV-1E and HV-3B to NORMAL. CLOSE steam valves PCV-1 and PCV-3 by pushing reset button HSS-1 and relatching the control lever on PSV-3.
3. Complete form UCN-6963, "End-of-Cycle Check of ORR Cell Ventilation and Pressurizable Off-Gas Systems".

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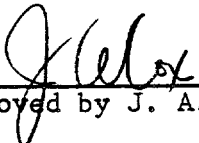
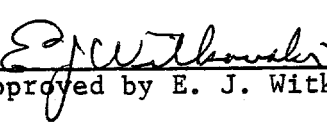
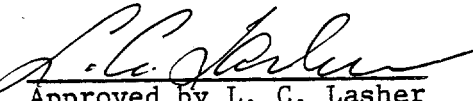
  
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L. C. Lasher

3.3.9. Test Procedure for 8-in. Vacuum Relief Valve at 3039 Off-Gas System

## Test Procedure:

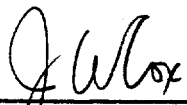
1. Loosen the eight (8) bolts of the flanged joint between intake hood and valve. Remove the top four (4) bolts. Insert 1/4-in. thick x 10-1/2-in. O.D. blind between flanges. Replace bolts and tighten joint with blind in place.
2. Verify that V-1, V-2, and V-4 are open, and V-3 is closed.
3. Open V-3 slowly. Reading of PI located at V-2 should drop slowly. When V-3 is full open, reading of PI should be nearly zero. Close V-3. PI should return to its original indication. This verifies that the 1/2 -in. sensing line is clear and that PI is operating.
4. Connect vacuum pump (minimum capacity required - 10-in. Hg) and 0-10 in. Hg manometer to V-3.
5. Close V-4. Start vacuum pump.
6. Using throttle valve, evacuate vacuum connections to 6-in. Hg reading on manometer.
7. Observe position of indicator on valve diaphragm.
8. Open valve V-3.
9. When reading of the manometer reaches 6-in. Hg, observe position of diaphragm indicator and the PI.
10. Increase vacuum until reading of manometer reaches 8-in. Hg. Observe position of diaphragm indicator and PI. Repeat for increase to 10-in. Hg.
11. Close valve V-3. Open valve V-4.

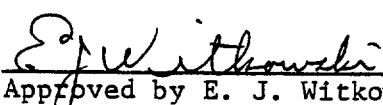
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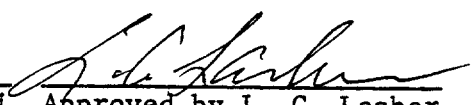
12. Turn off vacuum pump and disconnect test equipment.
13. Remove blind flange and return hood to original position.

NOTE: The valve position indicator should read 3/16 in. at 6-in. Hg vacuum, 9/16 in. at 8-in. Hg, and 15/16-in. Hg vacuum at 10-in. Hg vacuum. It is expected to fully relieve the system with one 4,000 CFM blower operating if the vacuum reaches 8-in. Hg.

This test procedure checks the mechanical operability of the valve and sensing connections and checks calibration of the PI.

  
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## 5. PROCESS WASTE SYSTEM, MELTON VALLEY

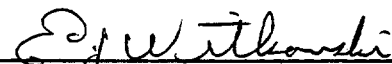
## 5.1. Description of Facilities

5.1.1. General Description

Process waste originating in Melton Valley consists normally of "cold" or nonradioactive process effluents which are either exposed or potentially exposed to the possibility of contamination. Such effluents include cooling water from process equipment; waste from laboratory sink, hood, and floor drains; water from cell shields; and other liquid waste which, though normally nonradioactive, may, through inadvertent circumstances, contain small quantities of radioactivity. The volume of low-level waste generated by a typical research facility ranges from a few hundred to several thousand gallons per day. Processing of this waste is carried out in the same manner as in Bethel Valley; i.e., a monitoring system determines if activity is present and, if so, the waste is decontaminated before release to the stream and river system. The facility for accomplishing this consists of a number of collection ponds wherein effluents are segregated by a monitoring system according to the activity present and a pumping station for transfer of the radioactive waste to the treatment plant in Bethel Valley.

5.1.2. Collection Ponds

Three ponds, located south of the HFIR facility, receive low-level waste from the HFIR, TRU, and TURF facilities (Figure 5.1). Pond No. 1 (240,000 gal) normally receives "cold" waste from HFIR; TRU and TURF

  
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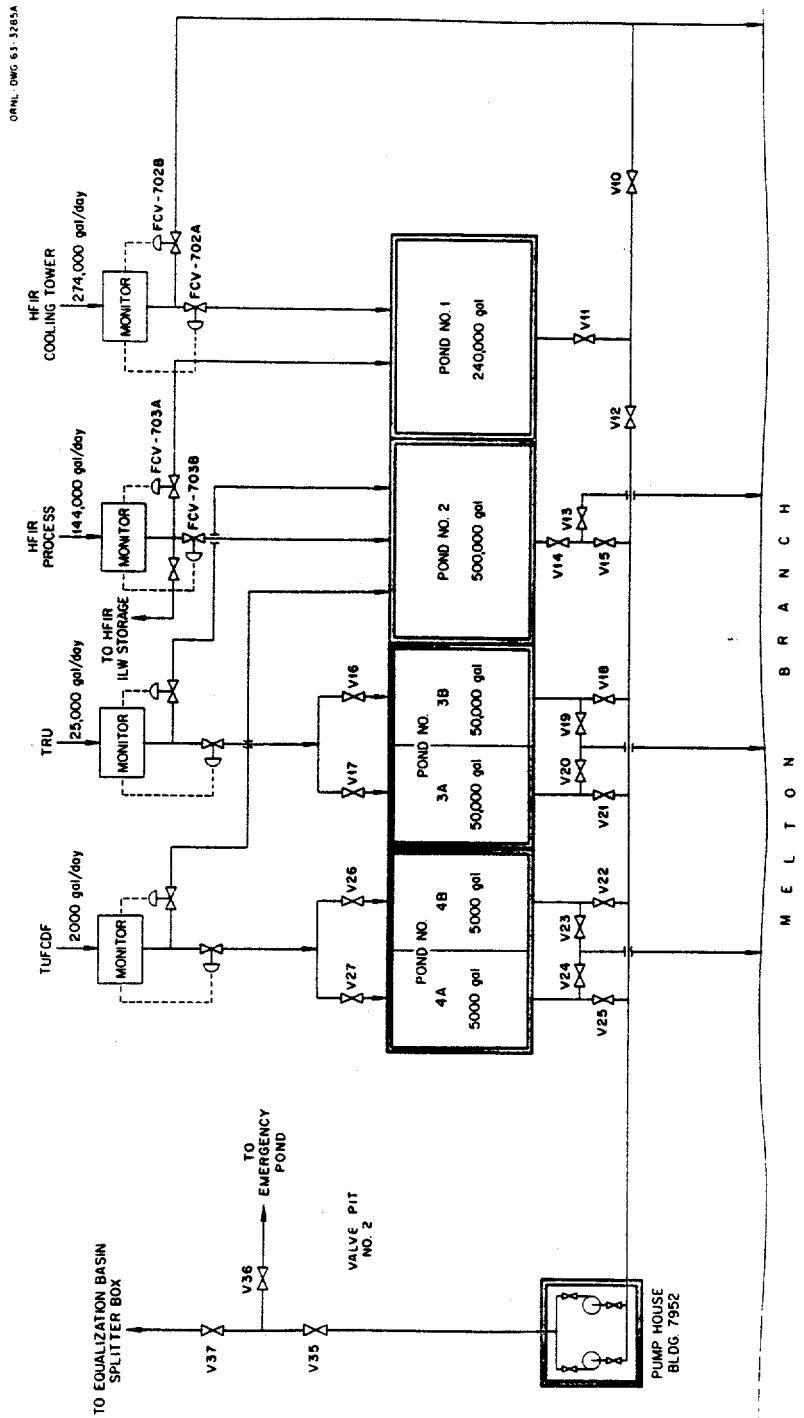


Fig. 5.1. Schematic of the Melton Valley Process Waste System

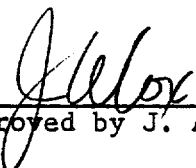
discharge similar waste to a common pond with a capacity of 100,000 gal.\* These two ponds, after sampling, are drained to Melton Branch. Pond No. 2 (500,000 gal) receives waste from each of the facilities in the event the activity level of the waste prohibits release to Melton Branch. When the activity level exceeds five beta counts  $\text{min}^{-1}\text{ml}^{-1}$  and zero alpha counts  $\text{min}^{-1}\text{ml}^{-1}$ , the waste is pumped to Pond No. 2. Material collected here is pumped to Bethel Valley for decontamination at the Waste Treatment Plant.

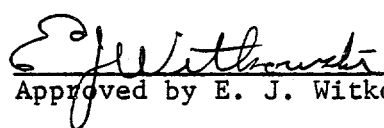
#### 5.1.3. Pumping Station

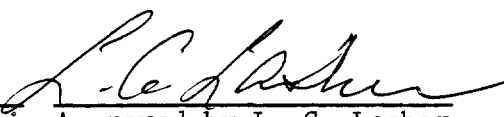
The Process Waste Pumping Station, Building 7952, is located near the southwest corner of Collection Pond No. 2. In the lower level of this building are located the two waste-transfer pumps shown in the flow diagram in Figure 5.2. These pumps, one of which is a standby, are Gould centrifugals each rated at 400 gpm at a head of 160 ft. Seepage from the pump water seals flows to a sump from whence it may be pumped back to the collection pond. All valving in the station is operated from the upper level by means of extensions passing through the grating floor. The station is equipped with a monorail hoist to facilitate the replacement of the pumps or other heavy items.

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\*The TRU and TURF pond is further subdivided into two sections which are alternately filled and emptied.

  
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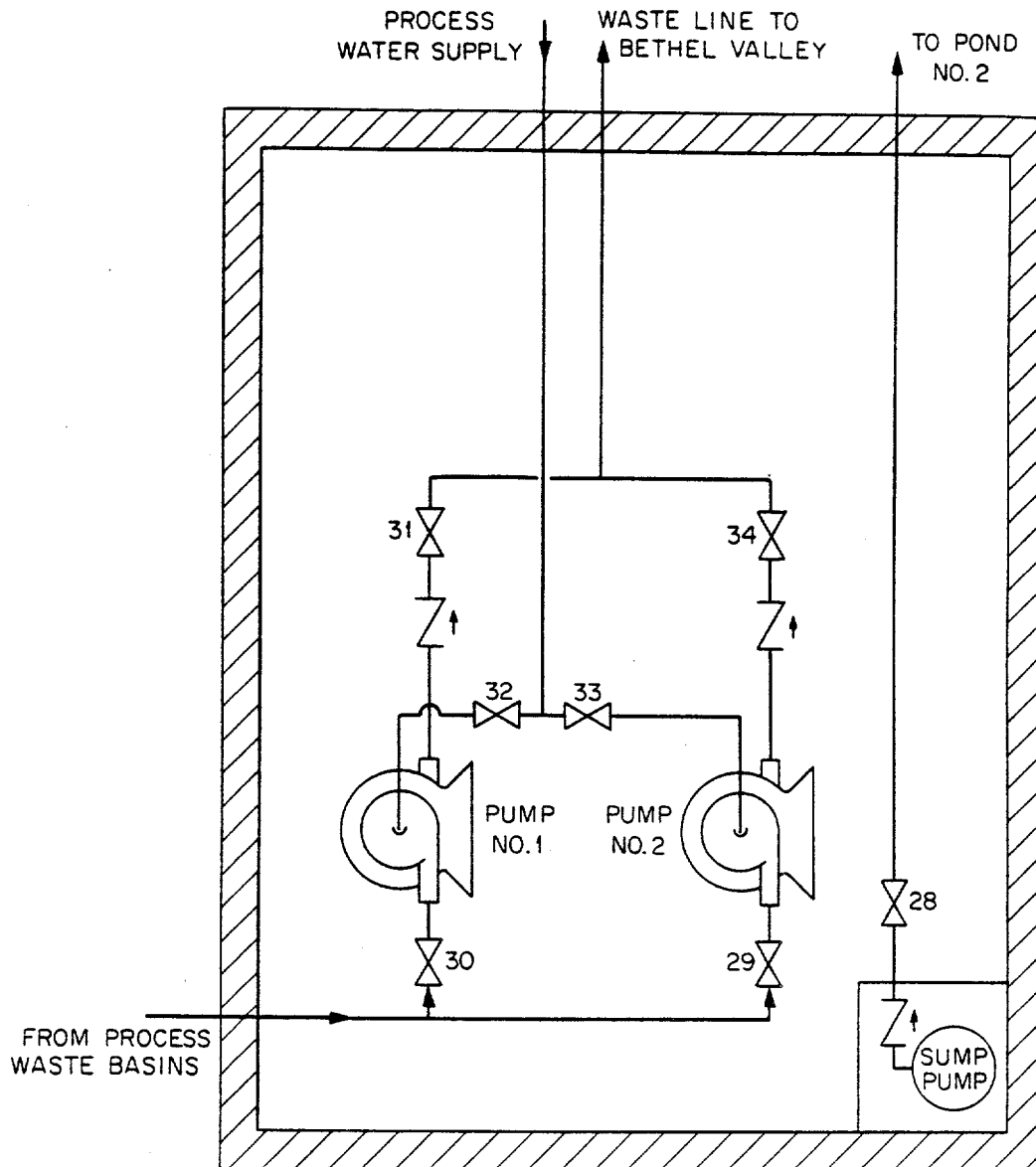


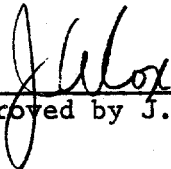
Fig. 5.2. Flow Sheet - Process Waste Pumping Station

5.1.4. Transfer Line

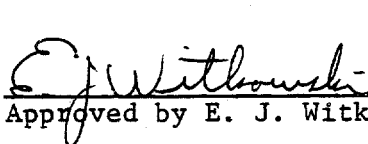
A 6-in. mechanical-joint cast iron pipeline carries the waste from the pumping station to the splitter box located at the Equalization Basin in Bethel Valley. A 6-in. pipeline to the emergency impoundment basin is connected to the main line through a tee (Valve Pit No. 2) and is available if transfer to the basin is necessary.

5.1.5. Monitoring Stations

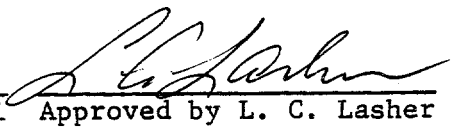
Four monitoring stations operate to control the disposal of radioactivity in the waste streams from the Melton Valley facilities. The basic equipment consists of a weir box in each stream from which a continuous sample stream is pumped through a shielded container housing one or more radiation detectors. The activity detected here is indicated locally on a count-rate meter and is recorded both at the particular Melton Valley facility and at the Waste Monitoring Control Center, Building 3105, in Bethel Valley. If the activity in the stream passing through the monitor exceeds a preset limit, a diversion valve is actuated automatically to route the waste to a pond from which it may be pumped to the treatment plant. Flow is measured by means of the weir and a bubbler. This information, likewise, is read out locally and is also telemetered both to the facility involved and to the control center where it is recorded. The flow recorder at the monitor station serves not only to indicate the instantaneous flow but also to operate integrators which totalize the volume of flow passing through the station. Two integrators, A and B, at



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each station are used to measure separately the contaminated and the uncontaminated flows. A sampling pump, controlled by the integrators, provides a sample proportional in volume to the flow through the station. As two integrators are required to measure separately the two flows, so two sample collection bottles, A and B, are used to collect samples from the two streams. By operating the monitor stations in this manner, a continuous record is secured of the volume of both the contaminated and uncontaminated waste generated; and a proportional sample of each type of waste is always available whenever a transfer is to be made.

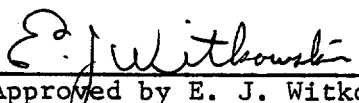
## 5.2. Operating Procedures

### 5.2.1. Sampling Procedure Prior to Transfer

In order to keep an accurate inventory of the radioactivity released to Melton Branch or processed at the treatment plant, it is essential that flow integrator readings be recorded and samples taken each time a transfer is made from a pond. When a transfer is made, proceed as follows:

<u>To Transfer From</u>	<u>Take a Sample &amp; Integrator Reading At</u>
Pond No. 1	"B" at HFIR Process Monitor "A" at HFIR Cooling Tower Monitor
Pond No. 2	"A" at TRU, TURF, and HFIR Process Monitors
Pond No. 3	"B" at the TRU and TURF Monitors

  
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When transferring from Pond No. 3, take the designated sample and integrator reading after the incoming flow is switched from section "A" to section "B". Before and after a transfer is made from any pond, record the reading of the staff gauge in the pond. Log all information on sampling and flows on the Process Waste Transfer Data Sheet.

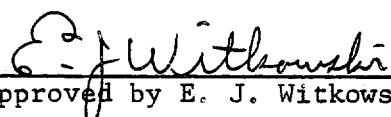
#### 5.2.2. Procedure for Transfer of Waste

CAUTION: Do not operate pumps with suction valves closed. To transfer waste from any pond to either the Equalization Basin, the emergency pond, or Melton Branch, proceed as directed in Table 5.1 (see Figure 5.2).

#### 5.2.3. Emptying the Pumping Station Sump

The waste transfer pumps are equipped with water seals to prevent the out-leakage of contamination (valves V-32 and V-33, Figure 5.2). Any leakage from the pumps should be free from activity and will drain to the sump located in the corner of the building. This may be pumped back to pond No. 2 by opening valve V-28 and starting the sump pump.

  
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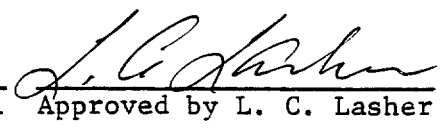
  
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Table 5.1. Procedures for Transferring from Process Waste Ponds

To Transfer from Pond No.	To			Open Valves V- At		
	Equalization Basin	Emergency Pond	Melton Branch	Pond Discharge	Pump Station Bldg. 7952	Valve Pit No. 2, Lagoon and 7500 Rds.
1	X	X		11, 12 11, 12	30, 31, 32 (Pump No. 1)	35, 37 36
			X	10, 11	or 29, 33, 34 (Pump No. 2)	
2	X	X		14, 15 14, 15 13		35, 37 36
			X	(With supervisory approval only)		
3-A (West)	X			16, 21 (Close 17)		35, 37
		X		16, 21 (Close 17)		36
			X	20		
3-B (East)	X			17, 18 (Close 16)		35, 37
		X		17, 18 (Close 16)		36
			X	19		

## 6. OPERATING RECORDS

## 6.1. Daily Records

6.1.1. Shift Check Sheets

Patrol - The shift check sheets for patrol operations will be discussed in Section 9.

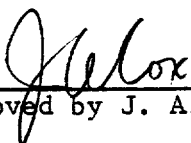
Waste Treatment Plant - The data sheets for liquid waste treatment are titled "ILW/PW Inventory and Transfers", Figures 6.1 and 6.1a. They give a complete record of waste processing, storage, transfer, and radioactivity analyses. The sheets cover one day's activities and the information is used in compiling the weekly summary and quarterly reports.

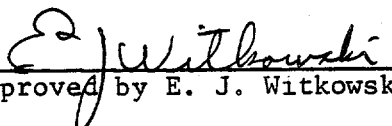
Building 3105 - Checks of instrument readings are made each hour and are recorded on daily sheets, Figures 6.2, 6.3, and 6.4. These records are used in compiling the weekly summary.

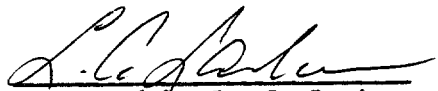
6.1.2. Shift Log Books

Supervisors Log - In this book the supervisor writes special information and gives directions to the operators who work the 4-12 and 12-8 shifts.

Operators Log - This is a brief account of the work done by the operator at the Waste Treatment Plant and the Waste Evaporator and gives the status of these facilities and the tank farm at the end of the shift. A complete account of the malfunction or abnormal operation of any equipment should be recorded in this log.

  
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Approved by L. C. Lasher

## ILW/PW INVENTORY AND TRANSFERS

DATE

TANK	TIME								
	AM			PM					
	2 Volume, Gals	6 Vol.	pH	10 Volume	2 Vol.	pH	6 Volume	10 Vol.	pH
WC-1									
WC-2									
WC-3									
WC-4									
WC-5									
WC-6									
WC-7									
WC-8									
WC-9									
WC-10									
WC-11									
WC-12									
WC-13									
WC-14									
WC-19									
W-1									
W-12									
W-13									
W-14									
W-15									
W-16									
W-17									
W-18									
HFIR									
7500									
W-3									
W-4									
W-5									
W-6									
W-7									
W-8									
W-9									
W-10									
T-1									
T-2									

Fig. 6.1. Form UCN-4968. This form is used for recording waste volumes, pH's, transfers, and other data. Page 1.

## MILW/PW INVENTORY AND TRANSFERS

## PROCESS WASTE

[illegible][illegible][illegible]

Fig. 6.1a. Form UCN-4968. Page 2.

Activity - CPM  
Flow - GPH

Date \_\_\_\_\_

PROCESS WASTE FLOWS AND ACTIVITIES

Hour	MH-234 Isotopes Area		MH-114 Reactor Area		MH-190 4500 Area		MH-209 FPD Area		MH-229 Bldg. 3508-3503		MH-149 Bldg. 3025-3026		MH-25 Bldg. 3019		MH-235 HRLAL		MH-240 HRLAL		MH-243 ILW Evaporator		Diversion Box	
	Act.	Flow	Act.	Flow	Act.	Flow	Act.	Flow	Act.	Flow	Act.	Flow	Act.	Flow	Act.	Flow	Act.	Flow	Act.	Flow	Act.	Flow
Full Scale →		10K		15K		25K		5K		5K		5K		5K		15K		7K		14K		60K
1																						
2																						
3																						
4																						
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7																						
8																						
9																						
10																						
11																						
12																						

12-8 Shift \_\_\_\_\_

8-4 Shift \_\_\_\_\_

4-12 Shift \_\_\_\_\_

UCN-6253  
(3 11-64)

Fig. 6.2. Form UCN-6253. Process waste flows and activities are entered here.

## GASEOUS WASTE MONITORING — STACKS

TIME	3039						3020						HFIR						MSRE						DATE
	Particulate Activity			Activity on Charcoal			Particulate Activity			Activity on Charcoal			Particulate Activity			Activity on Charcoal			Particulate Activity			Activity on Charcoal			
	Beta/Gamma CPM	Alpha CPM	Beta/Gamma CPM	Beta/Gamma CPM	Alpha CPM	Beta/Gamma CPM	Beta/Gamma CPM	Alpha CPM	Beta/Gamma CPM	Beta/Gamma CPM	Alpha CPM	Beta/Gamma CPM	Beta/Gamma CPM	Alpha CPM	Beta/Gamma CPM	Beta/Gamma CPM	Alpha CPM	Beta/Gamma CPM	Beta/Gamma CPM	Alpha CPM	Beta/Gamma CPM	Beta/Gamma CPM			
Range, FS →																									
1 AM																									
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12 N.																									
1 PM																									
2																									
3																									
4																									
5																									
6																									
7																									
8																									
9																									
10																									
11																									
12 M																									
12:00 SHIFT																									

Fig. 6.3. Form UCN-6252. Readouts from stack monitoring devices are recorded on this form.


## GASEOUS WASTE MONITORING — FACILITIES

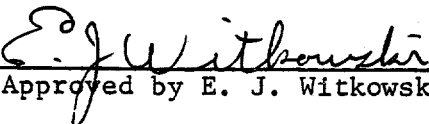
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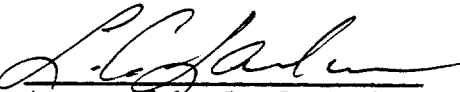
Fig. 6.4. Form UCN-6252A. Readouts from instruments monitoring facilities or areas are recorded here.

## 6.2. Other Records

1. Instrument charts from the tank farm and the monitoring stations in the waste disposal area are kept and used in the compilation of the quarterly report.
2. Analytical data from Gelman filters and charcoal cartridges are recorded in a special record book.
3. Special check lists are completed as a part of the continuous surveillance of the 3039 stack area operation. These are shown in Figures 6.5-6.9; their use is discussed in Section 3.
4. Supervision prepares a summary each week of the waste handled. This is recorded on the form shown in Figure 6.10.
5. A summary of the entire waste disposal operation is compiled by supervision and published on a monthly basis.

  
Approved by J. A. Cox

  
Approved by E. J. Witkowski

  
Approved by L. C. Lasher

## 3039 STACK AREA - CHECK LIST ROUTINE WEEKLY TEST PROCEDURE

ITEM	TURBINES				OTHER
	NORTH	3500	CENTRAL OG	AUX OG	
1. Start steam turbines by:					
a. Turn to TEST vent valves					
HV 61-D	x				
HV 63-C	x				
HV 21-D (Turn HV 22 to MANUAL)		x			
HV 23-C (Turn HV 22 to MANUAL)		x			
HV 41-D			x		
HV 43-C			x		
HV 1-D				x	
HV 3-A				x	
2. Check turbine operation (15 min)	x	x	x	x	
a. Blowdown valves CLOSED	x	x	x	x	
b. Oil mist lubrication NORMAL				x	
c. Cooling water ON	x	x	x	x	
3. Stop steam turbines; OPEN blowdown valves	x	x	x	x	
4. Start turbine-operated caustic pump; operate 15 min. Return to electric					x
5. See that all indicated flows and pressures are normal in Bldg. 3105					x

UCN-6962  
(3 8-66)

Fig. 6.5. Form UCN-6962. This check list is used during the weekly test of the 3039 Stack Area steam turbines.

## 3039 STACK AREA - CHECK LIST ROUTINE MONTHLY TEST PROCEDURE

DATE
TIME
BY

(Circle the "X" to indicate item checked)

ITEM	SYSTEM					OTHER
	NORTH CV	4500 CV	3500 CV	CENTRAL OG	AUX OG	
1. Turn OFF all alarm switches						x
2. Start steam turbines by:						
a. Turning to TEST vent valves						
HV 61-D	x					
HV 63-C	x					
HV 21-D			x			
HV 23-C			x			
HV 41-D				x		
HV 43-C				x		
HV 1-D					x	
HV 3-A					x	
b. Stopping electric blowers	x	x	x	x		
3. Check turbine operation (15 min)	x		x	x	x	
a. Blowdown valves CLOSED	x		x	x	x	
b. Oil mist lubrication NORMAL					x	
c. Cooling water ON	x		x	x	x	
4. Check damper positions						
a. Inlet pneumatic CLOSED 3025-26 electric	x					
b. Discharge backdraft CLOSED 3025-26 electric	x					
c. Inlet backdraft OPEN north turbine	x					
d. Inlet pneumatic CLOSED Isotopes electric	x					
e. Discharge backdraft CLOSED Isotopes electric	x					
f. Discharge pneumatic CLOSED 4500 electric		x				
g. Discharge backdraft CLOSED 4500 electric		x				
h. Discharge pneumatic CLOSED 3500 electric			x			
i. Discharge backdraft CLOSED 3500 electric			x			
j. Discharge backdraft OPEN 3500 turbine			x			
5. Start auxiliary OG electric blower and operate 15 min.					x	
6. Start electric blowers; stop steam turbines	x	x	x	x		
a. All dampers in Item 4 reversed	x	x	x			
b. Blowdown valves OPEN	x		x	x		
7. Start turbine-operated caustic pump; operate 15 min. Return to electric.						x
8. Check emergency air systems:						
a. CLOSE valve between supply and receiver tank						x
b. OPEN vent. Minimum air loss is NORMAL						x
c. Two cylinders on the Central OG system with a minimum pressure of 1000 psi.						x
9. Reset all alarm switches to NORMAL						x

UCN-6961  
(3 8-66)

Fig. 6.6. Form UCN-6961. A more extensive test of Stack Area equipment is made on a monthly basis. This check list is used at that time.

## 3039 STACK AREA - CHECK LIST PROCEDURE IN EVENT OF POWER FAILURE

DATE
TIME
BY

(Circle the "X" to indicate item checked)

ITEM	SYSTEM						OTHER
	NORTH	ORR CV	4500	3500	CENTRAL OG	AUX OG	
1. Silence horn by turning OFF all alarm switches							x
2. Check operation of turbines	x	x		x	x	x	
a. CLOSE blowdown valves	x	x		x	x	x	
b. Oil mist lubrication NORMAL						x	
c. Cooling water ON	x	x		x	x	x	
3. Check damper positions -							
a. Inlet pneumatic CLOSED 3025-26 electric	x						
b. Discharge backdraft CLOSED 3025-26 electric	x						
c. Discharge backdraft OPEN North Turbine	x						
d. Inlet pneumatic CLOSED Isotopes electric	x						
e. Discharge backdraft CLOSED Isotopes electric	x						
f. Discharge pneumatic (TOP) CLOSED ORR CV electric		x					
g. Discharge pneumatic (BOTTOM) CLOSED ORR CV electric		x					
h. Discharge pneumatic OPEN ORR CV turbine		x					
i. Discharge pneumatic CLOSED 4500 electric			x				
j. Discharge backdraft CLOSED 4500 electric			x				
k. Discharge pneumatic CLOSED 3500 electric				x			
l. Discharge backdraft CLOSED 3500 electric				x			
m. Discharge backdraft OPEN 3500 turbine				x			
4. Check operation of turbine pump on caustic scrubber					x		

UCN-6960  
(3 8-66)

Fig. 6.7. Form UCN-6960. This check list is used to insure the function of emergency equipment in the event of a power failure.

3039 STACK AREA - CHECK LIST PROCEDURE  
AFTER RESUMPTION OF NORMAL POWER

Date \_\_\_\_\_

Time \_\_\_\_\_

By \_\_\_\_\_

(Circle the "X" to Indicate Item Checked)

Item	Turbine					Other
	North	3500	Central OG	Aux OG	ORR CV	
1. Start electric blowers -						
a. 4500						x
b. 3025-26						x
c. Isotopes Area						x
d. ORR CV						x
e. Central OG						x
f. ORR POG						x
2. Shut down turbines -	x	x	x	x	x	
a. Open blowdown valves	x	x	x	x	x	
3.   a. Turn OFF turbine pump on caustic scrubber						x
b. Turn ON electric pump						x
4. Turn all alarm switches to NORMAL position						x
5. See that all stack area alarms in Bldg. 3105 are CLEAR						x

Fig. 6.8. Form UCN-6959. After normal power is resumed, the switchback to electric equipment is noted here.

**END-OF-CYCLE CHECK OF ORR CELL VENTILATION  
AND PRESSURIZABLE OFF-GAS SYSTEMS**

		DATE
		TIME
		BY
ITEM	CHECK (✓)	
1. Turn OFF alarm switches for ORR CV and POG blowers and notify ORR shift engineer of start of test		
2. Initiate operation of CV steam turbine by turning electric blower OFF		
3. Check turbine operation (15 min) a. Steam control valves OPEN b. Discharge dampers (2) CLOSED on electric blower c. Inlet damper OPEN on turbine		
4. Push damper reset button and restart electric blower		
5. Put steam turbine back on stand-by, as follows: a. Raise the reset lever on steam control valve, PV-110, to the UP position. b. Stop the air bleed in the control air line to steam control valve, PV-108, until the indicated pressure is 60 psi. Verify that the air bleed has stopped. c. Verify that the damper in the steam turbine discharge is CLOSED.		
6. Check the low-steam-pressure alarm by closing the chain valve in the steam line. Alarm will occur at about 75 psig (PI-118).		
7. Start the auxiliary OG steam turbine by a. Turning to TEST, vent valves HV 1-E HV 3-B b. Turning OFF the POG electric blower		
8. Turbine operation NORMAL (15 min): a. Blowdown valves CLOSED. b. Oil mist lubrication NORMAL c. Cooling water ON		
9. Restart electric blower; stop steam turbine a. Blowdown valves OPEN		
10. Reset alarm switches to NORMAL; notify ORR of end of test		

UCN-6963  
(3 0-66)

Fig. 6.9. Form UCN-6963. At the end of each ORR operating cycle, the ventilation systems for the reactor are checked using this form.

## WEEK ENDING

Fig. 6.10. Form UCN-4745. At the end of each week a summary of the waste discharges is prepared using this form.

## 7. EVACUATION PROCEDURES

Instructions for evacuation and taking cover will be given over the plant public address system. The operators will follow these instructions after completing the shutdown procedure given below:

## 7.1. Tank Farm, Process Waste Treatment Plant and Waste Evaporator

1. Stop all transfers of waste between concrete tanks.
2. Do not stop the waste transfers if monitoring tanks are being emptied.
3. Do not stop the Waste Treatment Plant operation.
4. Do not stop the Waste Evaporator operation.

## 7.2. 3039 Stack Area

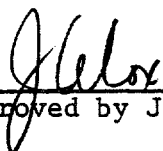
Do not shut down any operation.

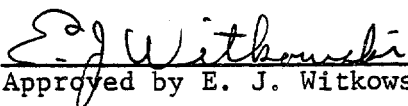
## 7.3. Equipment Decontamination Building

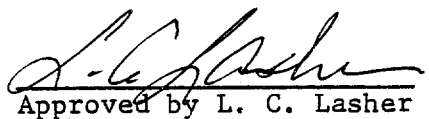
Stop all operations.

## 7.4. Practice Evacuation

The operator on duty at the Waste Monitoring Control Building 3105 and other operators who may be in the midst of an operation, such as a waste transfer, which if left unattended would create a hazard or risk damage to equipment, will remain at their stations. All other personnel will participate in the evacuation drill as instructed over the public address system.

  
Approved by J. A. Cox

  
Approved by E. J. Witkowski

  
Approved by L. C. Lasher

## 8. EQUIPMENT DECONTAMINATION

## 8.1. Requirements for Decontamination

"Decontamination is not a science, it is an art of trial and error".  
The total requirement is the reduction of the radiation level of a piece of equipment to an acceptable tolerance level as shown in Table 8.1.  
Any method that will do this without harm to the material being decontaminated is acceptable.

Table 8.1. Acceptable Tolerance Levels

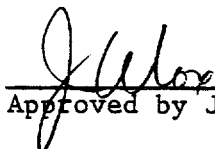
Salvage and Off-Area Shipment	No detectable radiation Maximum of 10 counts alpha Maximum of 20 counts beta
Nonrestricted Area Shops	Maximum of 1 mr/hr radiation Maximum of 10 counts alpha Maximum of 50 counts beta
Restricted Area Shops and Operating Area	Maximum of 7.5 mr/hr radiation Maximum of 10 counts alpha Maximum of 200 counts beta

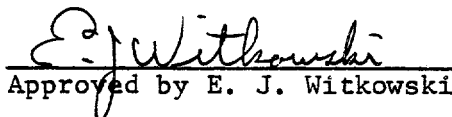
## 8.2. Decontamination Procedures

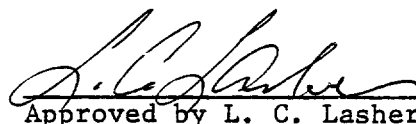
8.2.1. Solutions

For use with stainless steel, lead or glass -

1. Sodium Versenate - pH of 6
2. Citric acid - pH of 4-4.5

  
Approved by J. A. Cox

  
Approved by E. J. Witkowski

  
Approved by L. C. Lasher

3. Cleaning solution - Pour 1000 cc of concentrated  $H_2SO_4$  into 35 cc of saturated sodium dichromate.

Stainless steels or lead - 20%  $HNO_3$  (200 ml 70%  $HNO_3$ ) mixed with 3% HF (60 ml of 48% HF) and 740 ml of water (agitate for one hour cold).

All Materials -

1. Citric acid - pH 3-4 for everything except Sr, Ba, Ca; pH 4-4.5 for everything.
2. NaOH - To remove paint or grease and to clean mild steel fittings of foreign materials.
3. Varsol - To remove grease and oil.
4. Soap - Industrial type.
5. Soap abrasive - Old Dutch cleanser.

8.2.2. Procedures

All equipment with the exception of electrical equipment should be washed with a water hose to remove any loose contamination, contaminated dust, or dirt. Electrical and electronic equipment should be wiped with a wet cloth if approach is possible. Following the wash, all equipment should be broken down to its smallest component parts, dependent upon the decontamination levels desired, and all grease or oil removed by draining, scraping, or the use of a solvent (Varsol). If the contamination is still present to a limited degree, steaming and a soap-and-water scrubbing may complete the job. If after the soap-and-water treatment or treatments no progress is noted, more corrosive reagents must be used.

The materials to be decontaminated then must be separated according to type. If the contaminated material is wood, concrete, fabric, or plastic, it must be cut out and discarded.

If the material is aluminum, brass or copper, caustic must be avoided but citric acid of the proper pH can be used. Sodium versenate of the proper pH may also be used as it is a very mild reagent. Caution must be exercised when using citric acid inasmuch as it attacks the granular structure of the metals and causes a weakening of structural strength. NO CITRIC OR OTHER ACIDS ARE TO BE USED ON RIGGER'S EQUIPMENT SUCH AS CHOKERS, CABLES, COFFIN HOISTS, CHAIN FALLS, JACKS ETC., because of their load-bearing usage.

If the material is mild steel, lead, Durion or alloys similar to this, caustic can be used freely to remove paint, contamination, grease, paper, etc.

If the material is mild steel, lead, aluminum, stainless steel etc., weak acids can be used without too much corrosive danger providing the immersion time is low.

If the material is stainless steel, any reagent except hydrochloric acid can be used safely. Some of the more corrosive reagents which can be used, provided the immersion or circulation time is watched, are boiling  $\text{HNO}_3$ ; a cleaning solution of 35 cc saturated sodium dichromate with 1,000 cc of conc.  $\text{H}_2\text{SO}_4$ ; 20%  $\text{HNO}_3$  by wt with 3% HF by wt immersed for 1 hr, cold, with agitation; citric acid pH 4-4.5 or versent pH 6.

If the above methods fail, buffing and grinding, utilizing electric buffing machines may be successful.

In any case, all materials must be hand scrubbed with soap and water to remove the contamination to smear tolerance levels.

The following is an outline of procedures listed in order of difficulty of decontamination.

1. Wash with water.
2. Wash with Varsol if oily or greasy; scrape if the object is heavily greased or tarry.
3. Remove paint with NaOH. Do not use NaOH on bare brass or aluminum.
4. Cut away contaminated wood, tygon, concrete, fabric insulation, gaskets, etc., and discard.
5. Scrub with an abrasive soap such as Old Dutch cleanser.
6. Boil and scrub with trisodium phosphate or sodium carbonate.
7. Boil and scrub with sodium versenate at a pH greater than 6.
8. Immerse (watch for evidence of high corrosion rate) and scrub with citric acid at a pH of 4-4.5.
9. Immerse (watch for corrosion) and scrub with NaOH.
10. Immerse (watch for corrosion) and scrub with  $\text{HNO}_3$ ,  $\text{HCl}$ , or  $\text{H}_2\text{SO}_4$  as necessary.
11. Buff, wire brush, file, or grind away contamination.
12. If all procedures fail, discard the piece to be decontaminated or send it back to its owner.

## 9. PATROL ACTIVITIES

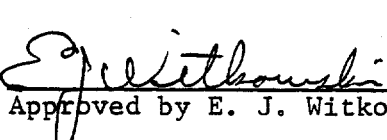
## 9.1. Function of the Patrol

The Patrol is the answer to a Laboratory-wide need for periodic checks of operation, experiments, and/or equipment. If someone needs to have an experiment checked periodically on the evening and midnight shifts or weekends, he calls an order in to the Laboratory Facilities Department and an operator makes the necessary checks at the desired intervals. Figure 9.1 is a sheet on which pertinent information concerning the job is recorded. An alternative to this is to have patrol information continuously telemetered by phone line to Building 3105 in such a manner as to cause an alarm if a particular piece of equipment or operation goes into an emergency state. The 3105 operator then takes certain steps as defined in the Procedure Memoranda Book. The remote monitoring system is tested semimonthly. The I&C technicians assigned to the 3105 facility are responsible for performing these tests.

## 9.2. Standard Patrol Work

Many patrol jobs are for only a short period of time. It would be impractical to try to write procedures for such operations. However, jobs that have become routine patrol work and those that may have special

  
Approved by J. A. Cox

  
Approved by E. J. Witkowski

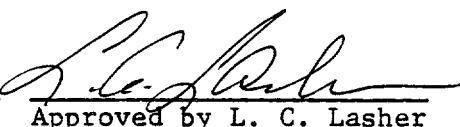
  
Approved by L. C. Lasher

Fig. 9.1. Form UCN-4405. Information describing patrol work is summarized here.

Fig. 9.1. Form UCN-4405. Information describing patrol work is summarized here.

hazards will be described in as much detail as is necessary. Routine jobs are placed on a check sheet shown in Figure 9.2. This sheet is revised periodically as needed. The blank areas are for writing in nonroutine jobs as they are placed on the patrol schedule.

#### 9.2.1. Refilling Cold Traps

Most of the cold traps that need periodic filling are located in the 5500 and 4500 areas. Procedures for filling the CO<sub>2</sub> traps and the liquid nitrogen traps are simple and will not be noted here. However, procedures for crushing the blocks of CO<sub>2</sub> and for filling the portable liquid nitrogen containers need to be discussed in detail.

#### Procedures for Operating the Dry Ice Crushing Machine

The machine is located in the basement of Building 5500 just north of the elevator.

1. Wear gloves and safety glasses.
2. See that no foreign materials are inside the crusher hopper before starting the motor.
3. See that the receiving tray is clean and empty.
4. Start the motor for the crusher. The switch is located on the vertical steel beam near the crusher.
5. When the cylinder reaches its maximum speed, drop a block of dry ice into the hopper. The dry ice is stored in an insulated storage box west of the crusher. Do not breathe fumes from the storage box more than absolutely necessary.
6. When sufficient ice has been crushed for the job requirements, stop the motor.

## PATROL DATA SHEET

Job						Date:
TYPE	FREQUENCY	LOCATION	ROOM	REQUESTER	TIME	PRECAUTIONS
Traps	4 hrs	Bldg	Room	McNabb		
Creeps		4500 S.	B-50	347070-5		
				Williams		
Instron	1 hr	4500 S.	B-55	347070-5		
				Kline		
Creeps	4 hrs	4500 S.	B-50	347070-5		
				Beeler		
Dialameter	4 hrs	4500 S.	B-50	347070-5		
Traps				Wright		
Creeps	4 hrs	4500 S.	B-50	347070-5		
				Walker		
Creeps	hrs	4500 S.	B-54	347070-5		
				Bullington		
Creeps	4 hrs	4500 S.	B-48	347070-5		
				Bolling		
Creeps	4 hrs	3025	Hot Cells	347070-5		
Brew				Patton		
Hi Temp	2 hrs	4500 S.	B-50	347070-5		
Ck Temp				Feltner		
"H" Furnace	4 hrs	4500 S.	B-54	347070-5		
N2 Traps				Egner		
Creeps	4 hrs	4500 S.	B-50	347070-5		
N2				Woods		
Traps	2 hrs	4501 S.	B-54	347070-5		
Open				Fitzpatrick		
Furnace	6: A.M.	4508	241	347020-1030		
				McNabb		
Tube Burst	4 hrs	4500 S.	B-50	347070-5		
				Beeler		
N2 Traps	4 hrs	4500 S.	B-54	347070-5		
				Bolling		
Creeps	4 hrs	2011		347070-5		
Spring Balance				McNabb		
& Weight Specs	4 hrs	4500 S.	B-50	347070-5		
				Southern		
Equipt Check	4 hrs	3010	Annex	347570-35		
				McNabb		
Rotate Specs	25 hrs	4500 S.	B-54	347070-5		
				Graves		
Creeps	4 hrs	4500 S.	B-54	347070-5		
Control Rm				Brooksbank		
Stack Area	4 hrs	3019	Vol	337070-165		
Bldg Check	4 hrs	3019	Thorex	Youngblood		
				337070-165		
Equipt Check	4 hrs	3019	Cell 4	Shannon		
				337070-165		
CK Furnace	4 hrs	3019	Alpha Lab			
				G0048K-A1 Stines		

Fig. 9.2. Example of routine patrol jobs are listed on this check sheet.

7. When the cylinder stops rotating, shovel the crushed ice from the tray into the carrying container.

#### Procedures for Filling Portable Liquid Nitrogen Containers

The liquid nitrogen storage container is a 2000-liter, double-shelled tank (Figure 9.3) located in the basement of Building 5500.

1. Place the containers to be filled near the liquid nitrogen storage container.
2. Direct the discharge end of the filling tube away from any person or equipment.
3. Open the drain valve from the storage container to the stainless steel hose and bleed out the pressure that is being generated in the warm hose.
4. If the pressure on the inner container is not at 8-10 psig and additional pressure is desired to hasten the filling of the containers, perform the following:
  - a. Close the container drain valve.
  - b. Open pressurizing valve (1) and allow liquid nitrogen to pass into pressurizing coil (2) where it is vaporized. This vapor returns to the tank and increases the container pressure.
  - c. When the desired pressure is attained (8-10 psig), close the pressurizing valve (1).
5. When the liquid nitrogen begins to flow out the end of the discharge tube, insert the stainless steel tube into the container to be filled.

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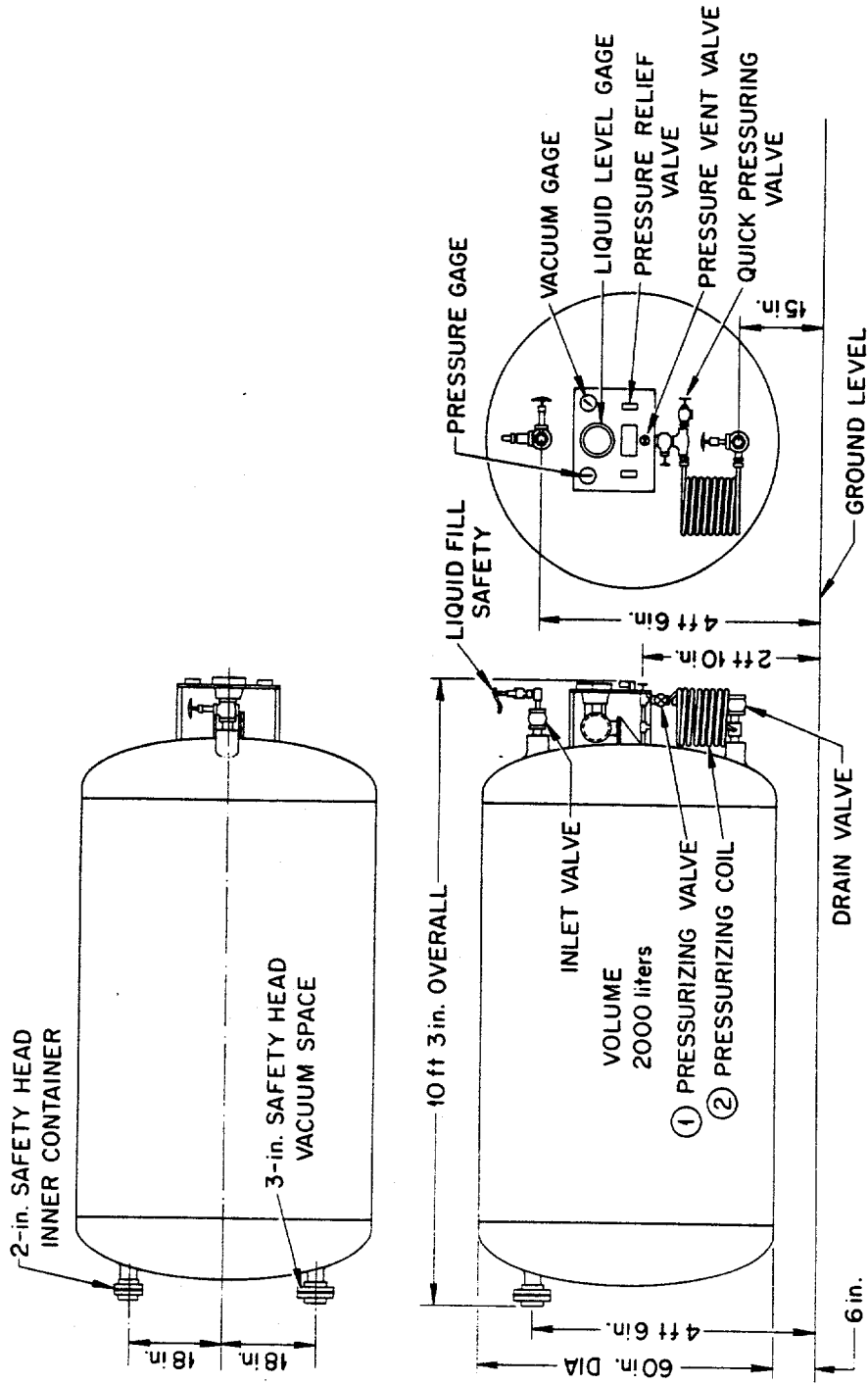


Fig. 9.3. Liquid Nitrogen Storage Container

6. The container is full when the liquid nitrogen starts to spill over.

7. When all containers have been filled, close the tank drain valve.

#### 9.2.2. Checks of Hydrogen Supplies

These checks are to insure a supply of hydrogen to certain operations. In general, the operator checks the pressure gauge at the manifold or at each cylinder if there is no manifold gauge. If the pressure is below a specified point, the operator changes tanks or groups of tanks according to directives. In addition to this check, some directives ask that furnace temperatures and other pertinent data be recorded.

#### 9.2.3. Procedures for Handling Gas Cylinders

The changing of hydrogen or other gas cylinders is a routine task that must be handled with caution. Special emphasis should be placed on the following hazards associated with the handling of these cylinders.

1. Check each cylinder for positive identification of the contents.
2. Handle cylinders as gently as possible. Rough handling such as dropping, hammering or falling over can cause them to rupture or explode.
3. Cylinders are not to be exposed to sunlight or other heat sources.
4. All cylinders must be supported in an upright position with chains or rack clamps.
5. Open cylinder valves SLOWLY. Be sure the gauge and reducing valve is pointing away from you when opening a cylinder valve.
6. All men who handle gas cylinders of any description MUST acquaint themselves with ORNL Standard Practice Procedure

No. 56-A, "Compressed Gas Cylinders and Regulators" and "Safe Practices for Handling Compressed Gas Cylinders".

9.2.4. Checks of the 4500 Area Oxygen Supply

This oxygen supply is located in a small room at the south end of Wing A on the loading dock of Building 4500. Specific checks to be made are as follows:

1. The manifold pressure is maintained at 8-10 psig.
2. The banks of cylinders are alternated in use when all the individual cylinders are exhausted to no lower than 50 psig.  
(It may be advantageous to the operator's work schedule in some cases to change the banks when more pressure than 50 psig remains in the cylinders or even when less than 50 psig remains in the cylinders. However, under no conditions is any cylinder to be exhausted to less than 20 psig.)
3. The individual, exhausted cylinders are replaced with full cylinders as soon as practicable after the banks are alternated.
4. No other gases are stored in the room with the oxygen cylinders.
5. All exhausted cylinders are marked "Empty" with chalk.
6. All exhausted cylinders which have been removed from the manifold racks are capped.
7. Make sure there are no leaks in the system after replacing exhausted cylinders with full cylinders.
8. Investigate excessive use of oxygen above the normal requirements. (A search of various rooms and laboratories using this service may be necessary to locate loss of gas. Look for broken hoses, open valves, broken fittings, etc. Report to your supervisor if additional help is needed.)

9. The log sheets are completed showing individual cylinder pressures, manifold pressure, time of check and operator's initials.

This record is located at the cylinder manifold.

Special hazards associated with the handling of oxygen tanks and the special precautions of this particular system are as follows:

1. No grease, oil, pipe dope, greasy gloves or organics of any kind are to come in contact with the cylinder valve or supply connections. Very serious danger of fire exists when these materials are combined with oxygen.
2. If the discharge from the regulating valve drops below 8 psig, an alarm bell rings. This bell is located in the shop north of the oxygen supply room. The alarm can be silenced only by raising the discharge pressure level to above 8 psig. However, if the pressure exceeds 12 psig, there is danger of blowing apart hose connections and equipment in the laboratories using this equipment.

#### 9.2.5. Care in the Handling of Transfer Casks

If a transfer cask is to be transported from or within the Division area by other than research or Division personnel, the cask, whether empty or containing a specimen, must be tagged to show its origin, destination, contents, radiation level, degree of contamination, any handling precautions, name of the person responsible, date of the transaction, and name of the person preparing the tag. This also applies to any radioactive material whether shielded or unshielded.

No transfer cask will be received by the Division at any facility unless it bears a tag as described above. The only exception is for

transfers involving only the Division when close supervision is being exercised and temporary storage is not required.